THE WELDING ENGINEER

NOVEMBER, 1950

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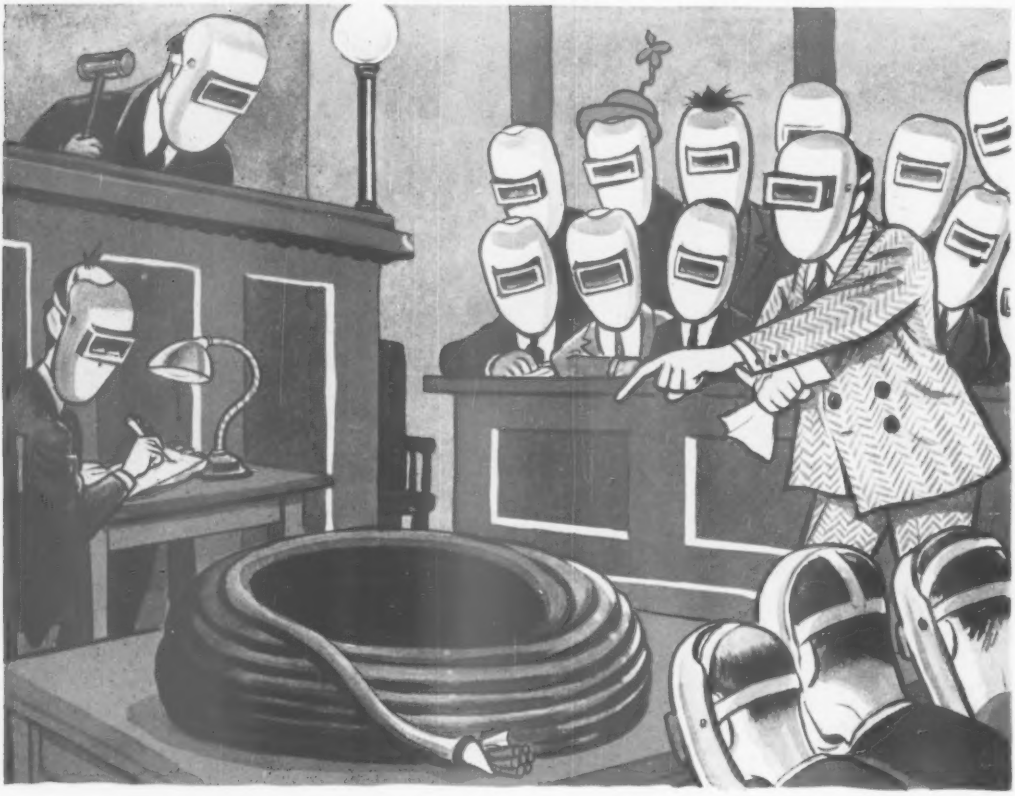

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"Objection."

"Objection sustained."

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NOVEMBER, 1950

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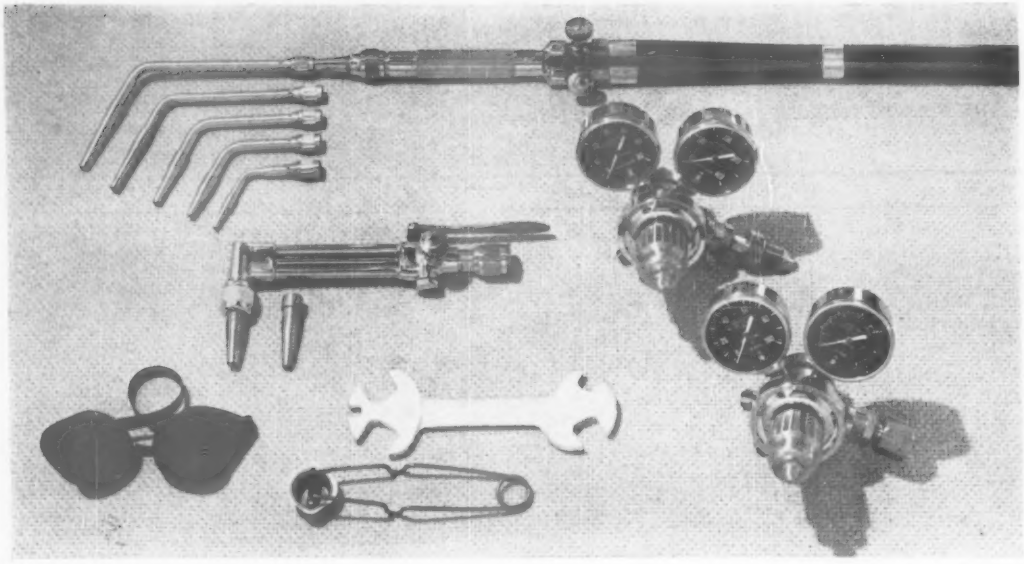

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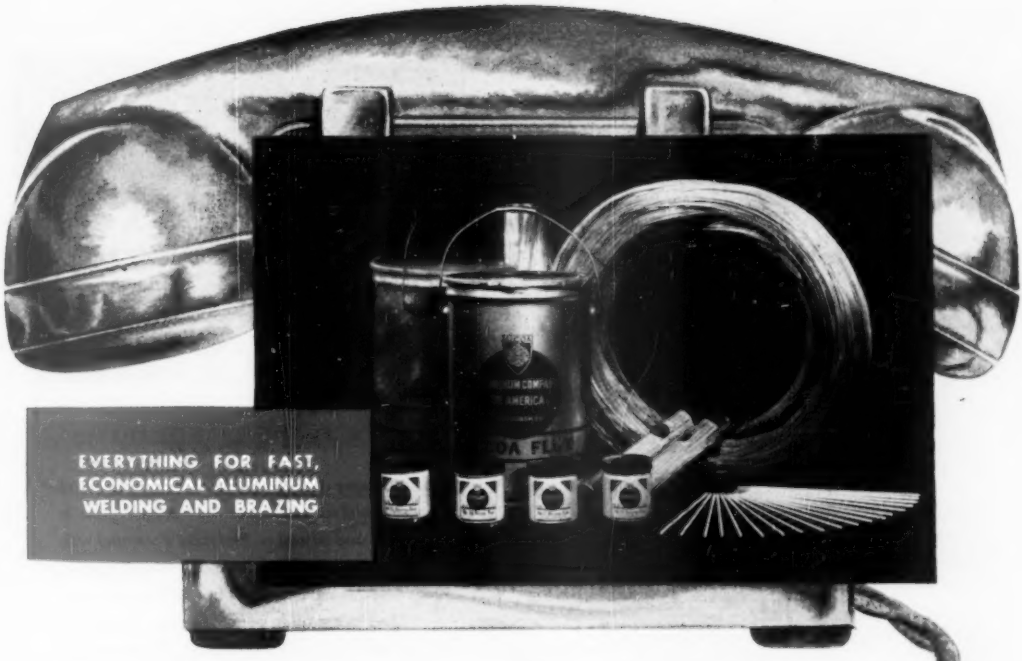

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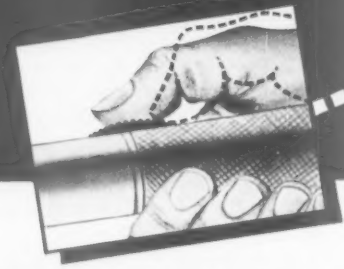
5. When you next see a torch burning, without being applied to work, decide to DO something about it! Contact the nearest Harris Exclusive Distributor, located in principal Cities. Better yet, do it now.



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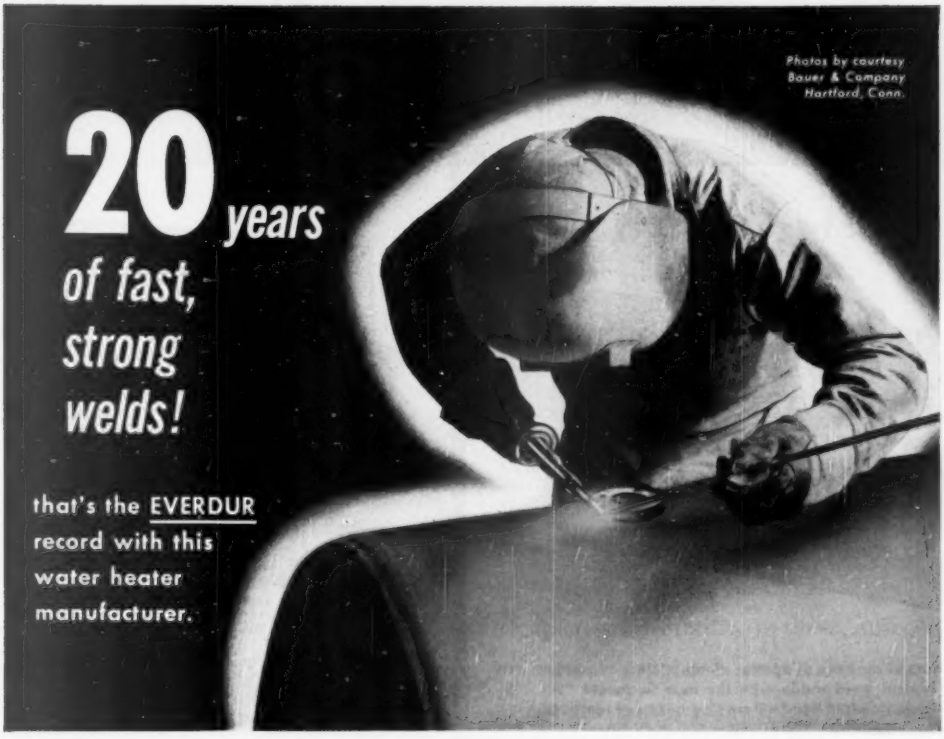

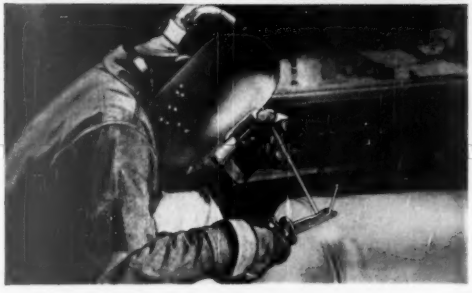

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*Reg. U. S. Pat. Off.

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2. *Carbon-arc welding of longitudinal seam in Bauer Water Heater 150-gal. tank with EVERDUR Welding Rod. Tank material is .129" gage Everdur Sheet.*
3. *Welding Everdur tank head to body.*

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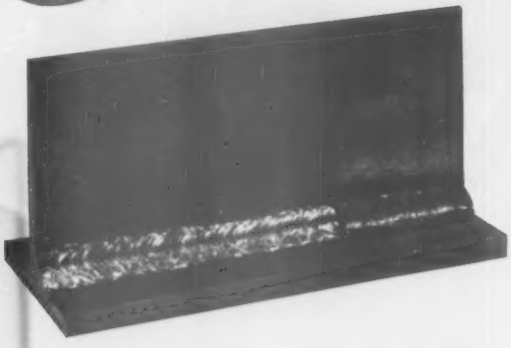
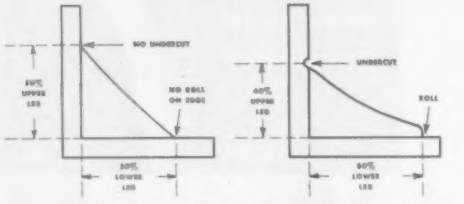
3 New Sureweld® Electrodes



Note unusual absence of spatter along uncleaned portion of this typical weld made with the new Sureweld "G". Note smooth finish of bead where slag has been removed.

Unretouched photograph of characteristic weld made with Sureweld "FD" showing smooth bead.



Sureweld "FD" Electrode **Most other "Hot Rods"**

1 GENERAL-USE

NEW *Sureweld* "G" (AWS E6012) ELECTRODE

This new general-use electrode is winning popularity for welds that are smooth, clean and good-looking. Absolutely odorless, the Sureweld "G" gives more inches of bead per rod, and is ideal for "stretching it out" . . . Give it a try, and you too will prefer it for all-position, general purpose welding. (Many users now choose Sureweld "G" in preference to the more expensive E6013 rods.)

1. Cleans easier.
2. Adaptable to "drag" technique.
3. "Spray-type" metal transfer (not "globular") for smooth-looking welds.
4. More inches of bead per rod.
5. Less spatter *than any other rod in the E6012 Class.*
6. Smooth arc-action and easy handling insure instant "welder appeal".

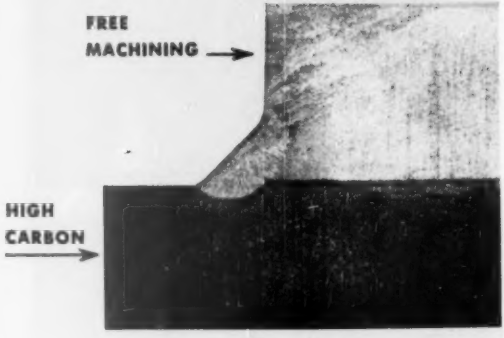
2 HIGH-SPEED

NEW *Sureweld* "FD" (AWS E6020) ELECTRODE

For highest quality deep groove and horizontal fillet welds, the new Sureweld "FD" is the answer. It's the fastest "downhand rod" in the business, as one trial will quickly prove. The coating will not break down under abusive heats, and you can get sound welds from the shortest stub you can hold. For best results in flat position welding, try the new Sureweld "FD".

1. Excellent cleaning properties.
2. Absence of spatter.
3. Bead appearance is almost ripple-free.
4. No excess fluidity, no undercutting. Fillet welds have legs of equal length.
5. Wash-back of arc-stream is so spaced that the bead is always covered with slag of uniform distribution and density.
6. Takes unusually high heats.

....winning instant preference!



Excellent fusion of hard-to-weld metals is shown in this macrograph of a typical weld made with the new Sureweld "7016" electrode.

3 LOW-HYDROGEN

NEW *Sureweld* "7016" (AWS E7016) ELECTRODE

Because it produces welds of minimum hydrogen content, Sureweld "7016" has proved without equal for welding free-machining types of steel, the air-hardening types with an alloy content or high carbon, and other hard-to-weld steels. There is absolutely *no* underbead cracking, and welds made with "7016" have beads that feather equi-distantly from the joint. ("7016" is replacing the more expensive stainless steel types.)

1. No cracking, even with the hardest-to-weld steels, when properly used.
2. Welds contain less hydrogen *by test*.
3. No excess fluidity. Bead is symmetrical. Average welders become experts when they use "7016".
4. High deposition rate saves working time.
5. High efficiency—more pounds of weld metal per pound of electrode—saves money.
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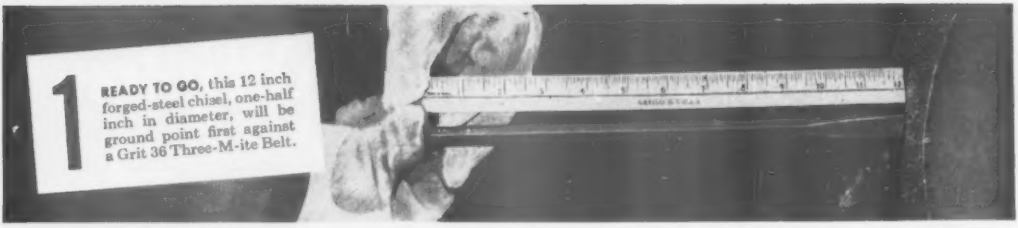
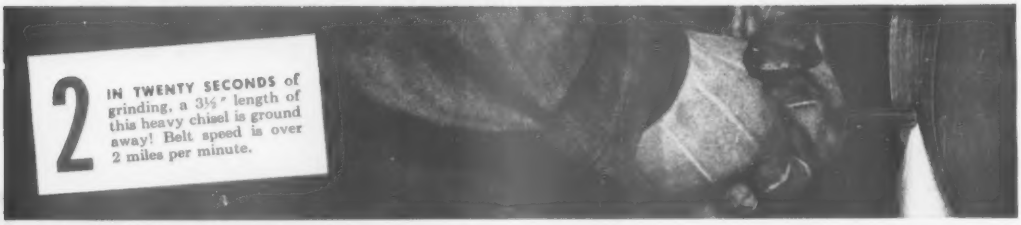
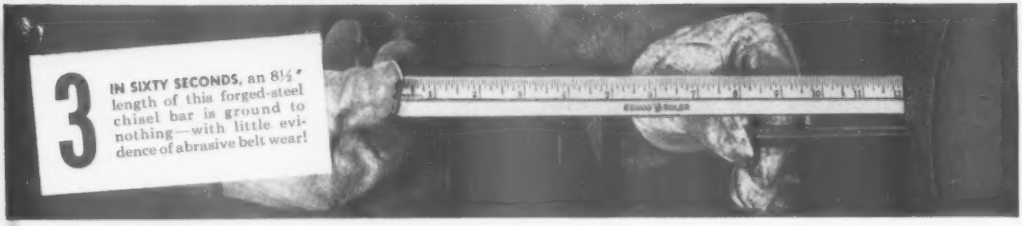

1
READY TO GO, this 12 inch forged-steel chisel, one-half inch in diameter, will be ground point first against a Grit 36 Three-M-ite Belt.




3
IN SIXTY SECONDS, an 8½" length of this forged-steel chisel bar is ground to nothing—with little evidence of abrasive belt wear!

Only 3M Abrasive Belts give you grinding speed like this!

The 3M Abrasive Belt used in this dramatic test was driven at over 2 miles a minute, with complete safety. In just 60 seconds, a ½" diameter forged-steel chisel was ground from 12" long down to 3½"—total of 8½", with little evidence of abrasive belt wear.

What does this remarkable test mean to you? It means the 3M Method and 3M Abrasive Belts can cut your grinding time and abrasive cost. It means real abrasive stamina and quality—the kind you learn to expect when you specify 3M Abrasive Belts.

WE INVITE YOU TO USE OUR DEMONSTRATION ROOMS to work out faster and more economical grinding and finishing methods. A 3M Methods Engineer will show you how modern belt grinding equipment can cut costs. For the address of your nearest 3M Demonstration Room, write Dept. WE-115.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N.Y. • In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

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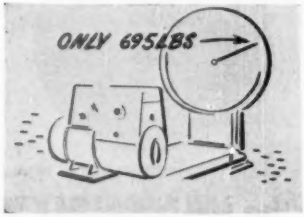
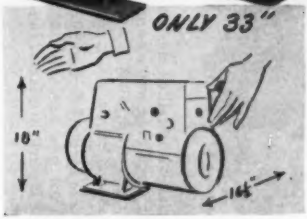
BUILT-IN REMOTE CONTROL Dial-lectric feature gives full arc-control at the work . . . saves operator's time . . . saves floor space for production.

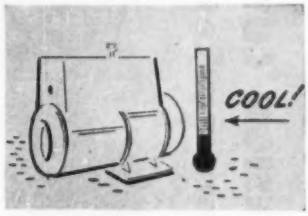
SLOW SPEED Lowest rpm per pound of weight. Only 1750 rpm for less wear, longer life, and minimum replacement costs. So quiet you hardly hear it.



LIGHT WEIGHT Easy to handle and move. Facilitates mounting off the floor and out of the way so there's more room for turning large weldments. Weighs only 695 lbs.



STURDY AND COMPACT Four sets of main brushes and one auxiliary set firmly fastened for good commutation. Simple design and rigid construction throughout . . . space-saving dimensions.



COOL OPERATION Slow speed plus extra large stator-frame cooling surfaces, and dual fans (for generator and motor) — make this the coolest welder you have ever seen.

● Stationary or portable mountings—Additional Features: single heat control; life-time sealed bearings; push-button start- and -stop switch with overload protection; high-low range switch; and polarity reversing switch. Get all the facts. Call your P&H representative, or send in coupon.

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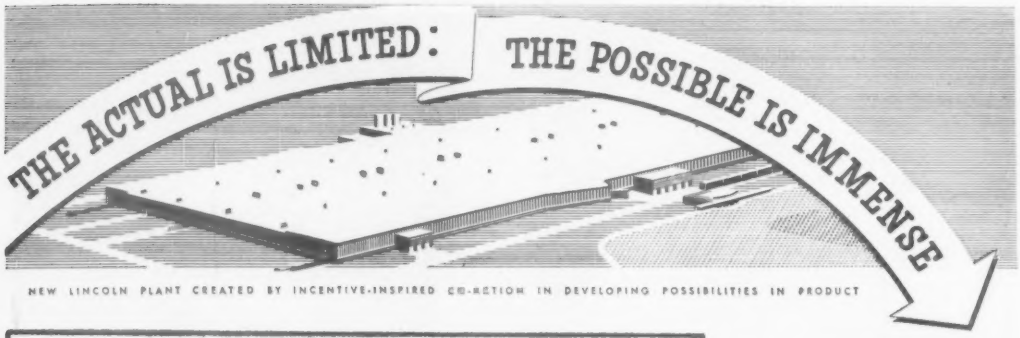
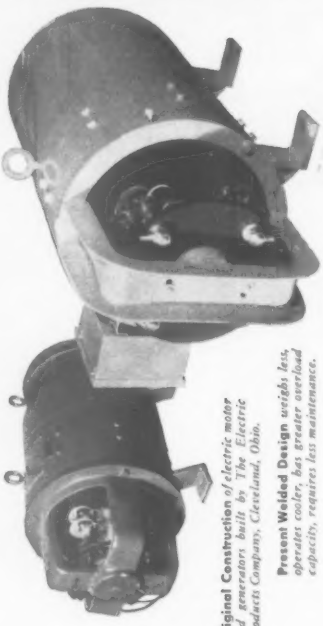


NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

WELDED DESIGN CUTS PRODUCTION COSTS
. . . opens new markets for machinery builder

Automatic Welding *of typical motor end bracket . . produces smooth, uniform bead, saves manual cleaning operations to cut production costs.*



Original Construction *of electric motor end generators built by The Electric Products Company, Cleveland, Ohio.*

Present Welded Design *weighs less, operates cooler, has greater overload capacity, requires less maintenance.*

THE need for less material with welded design . . . fewer man-hours for machining and assembly is cutting production costs from 10% up to nearly 50% as on the part shown below.

The immensity of the possible is being indicated also in expanding opportunities for new business now being realized at The Electric Products Company, Cleveland, Ohio. By making possible product modifications at low cost to meet specialized needs, arc welding is daily tapping additional sources for sales.

Improved performance, cooler operation and less maintenance are resulting from better electrical characteristics of welded steel construction . . . from compact, rugged design permitting larger core openings and more efficient ventilation.

the ACTUAL

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increasing the YIELD

PRESENT WELDED DESIGN

the IMMENSITY of the POSSIBLE turns out to be a 50% SAVING IN COST

SEE HOW ARC WELDING IMPROVES PRODUCT ACCEPTANCE

Machine Design Sheets free on request. Write Dept. 711,

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 1, OHIO

ESTABLISHED 1914 THE WELDING ENGINEER NOVEMBER, 1950

Just One Little Vote!

GET READY to cast your vote on November 7. And call up your friends to see that they get to the polls, too. We can't possibly overemphasize the importance of voting.

In the 1948 election, only one out of every two persons eligible to vote exercised the privilege. Only 51% voting—that's a shameful record! What's happened to us Americans, anyway? Are we content to become another Russia?

Brave men of every generation have fought and died to preserve our right to vote. If we don't exercise that right, it will disappear—be swallowed up by a dictatorship of some kind or another. Don't let that happen!

History cites many examples of the importance of just one little vote. Perhaps the best example is when a sick man elected a President of the United States.

This story begins back in 1867 when a gentleman by the name of Oliver Perry Morton, then governor of Indiana, was running for the Senate. Though he was tremendously popular, Governor Morton had aroused the ire of many Hoosiers by switching his allegiance from the Democratic to the Republican Party. They were going to punish him at the polls.

Both Morton and his opponent—Daniel W. Voorhees—waged spirited campaigns. No Gallup poll could possibly have predicted which would be elected. So evenly matched were these candidates that the outcome of the contest remained unknown until the final ballot was cast. Yes, we mean the very last individual ballot. Governor Morton won his seat in the Senate by *just one vote!*

Let's look now at the sick man. He was a legal client of Governor Morton and one of the latter's best friends. Though desperately ill on election day, he insisted upon being carried to the polls so that he might cast his vote for his friend. Had he stayed home, as so many perfectly well voters do on every election day, Voorhees would have been elected to the United States Senate instead of Morton. And Rutherford B. Hayes might not have been the 19th President.

We'll skip a few years and go up to 1876, an election year in which a memorable contest took place. The Tilden-Hayes Presidential campaign ran high in excitement because of its equally matched contestants. The total tally when the popular vote was counted was: Samuel J. Tilden 4,294,885, Rutherford B. Hayes 4,033,850 votes. It looked as though Tilden was sure to be the new President, but the Electoral College found otherwise.

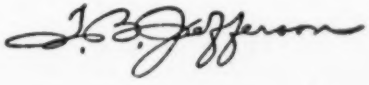
When the Electoral College counted the votes, it declared that Hayes had been elected over Tilden by one electoral vote. The resulting furor may be imagined. There hadn't been anything like it in American history since Jefferson and Burr had had their famous tangle three-quarters of a century before. After the charges, countercharges and name callings had somewhat subsided, the election was referred to an Electoral Committee composed of five Supreme Court justices, five senators and five representatives. This 15-man committee had the final say on who should be President of the United States during the next four years. And it voted—8 to 7—in favor of Hayes.

How does that tie in with our sick man? Very simply. One of the five senators who served on the Electoral Committee was Senator Morton of Indiana, a Republican. Just one extra Republican vote, one less Democratic vote, was needed to elect Hayes, and it was supplied by Morton. But Morton would not have been a senator and could not have served on the Electoral Committee had it not been for the devotion of his sick friend—a man so ill that he had to be carried to the polls on a stretcher.

That sick man's determination to vote elected his friend to the Senate and eventually elected a President of the United States. It is true that millions of other votes were cast but only one was needed to swing the balance.

Your own vote may be just as important. How would you feel if you stayed away from the polls when you could have been responsible for electing a President of the United States?

Go to the polls on November 7. Use your vote!



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D-C Welders

Strato Ships Spot Welded

Spot welding plays a prominent part in fabrication of huge airliners; surface smoothness is marked only by light electrode pressure. Here's how Boeing does it.

BY HOWARD E. JACKSON

BOEING AIRPLANE COMPANY'S new Strato Ships—the 67½-ton all-cargo Strato-freighters, their twin sister ships, the double deck, 80-passenger Strato-cruisers, and the radically new swept-wing Stratojet bombers—are built better, faster and more economically because of advanced engineering and shop practices of resistance welding. Of special interest are the rigid resistance-welding controls and methods of inspection.

Let's have a "look see" at the main building of the main plant in Seattle, Wash. Preliminary steps would start at No. 442 storeroom where aluminum and steel sheets (from 0.016 to 0.250 in.) are stored. The storeroom is located a short distance from the press department; the welding department beyond this area.

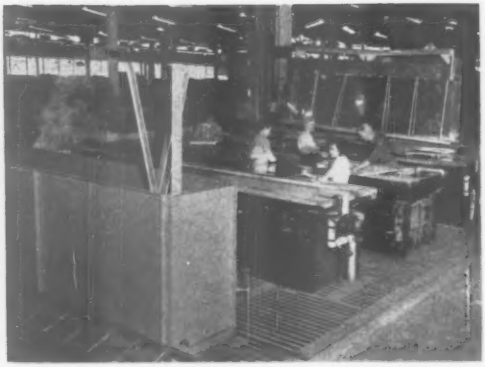
Material is transported from the storeroom by lift truck, by A-frame vertical-type trailers (most of them are made in the plant) or by flat-topped horizontal-type trailers. The A-frame trailer is used wherever possible since it carries more material, and the material is more easily handled. Obviously, it is less difficult to pick up a piece of material that is already standing on edge than it is to lift a sheet from a flat position on a low slung dolly.

PREWELD OPERATIONS

The material is sheared on one of a number of huge shears and passes on to the press brakes for bending, or to the adjacent routers, equipped with drills. Most of the wing skins are sheared, then drilled and routed. Much of the work goes to huge deep-drawing presses or to punch presses and stretch presses beyond the brakes and shears. It would be impossible here to cover the types of fabrication done before welding takes place: to describe the heavy-duty mechanical and hydraulic presses alone would constitute a separate article. One 450-ton double-action mechanical press is equipped with dies to turn out cowlings, fillets, frames and many other deep-drawn parts. An intricate multiple-roller machine forms the circumferentials that act as strengthening ribs for the fuselage sections.

Eventually, most of the partly fabricated parts land up at the welding department. The company has been using spot welding for the past 16 years in aircraft construction. Its technical men know that spot welding is smoother, faster and stronger than riveting—two rows of spot welds possess the strength of three rows of rivets. They have also found that smooth surfaces offer less air resistance and so increase speed. During the past war, the company designed and built automatic machines for mass-production spot welding.

CLEANING OF PARTS to degrease and remove oxides must precede welding. The parts are dried by hot air



MANY TYPES OF TANKS are needed. The cleaning is controlled by surface-resistance testing of samples

Spot welding at Boeing . . .

SHEAR TESTING of sample welds checks the set-up of the spot or seam welder before actual production runs. Other tests are made during assembly

However, the process was used mostly on non-structural parts, and a great amount of riveting was still done.

Today, riveting is kept to a minimum. The percentage of spot welding is being increased more and more in the production of the latest-type airplanes. Spot welding is now employed in primary as well as secondary structure. For those who don't know the distinction, secondary structure can break and yet will not endanger anything or anybody in the airplane; primary structure is something in the airplane that if it breaks endangers the craft and its occupants.

In order to add to the quality of Boeing's newest Strato Ships, the spot-welding shop has prepared a definite course of instruction for each new employee to follow. Nowhere else in the factory is work more carefully watched or more closely checked than in spot welding. Throughout the entire procedure, rigid and painstaking control of every step is maintained.

Boeing's spot-welding program breaks naturally into three divisions: (1) the cleaning of the pieces to be welded; (2) the assembling of those pieces and (3) the actual welding.

Cleaning and Handling

Cleaning begins with a bath in an alkaline degreasing solution. The parts to be welded are then washed and passed through an oxide-removing solution of hydrofluosilicic acid; they are washed again and dried in hot air. Following cleaning, a buffing treatment is given to the mating surfaces that are required to form high-strength joints. The parts are handled with gloves (literally) all through this cleansing process and until the welding has been accomplished.

To prevent the re-formation of oxide films on the freshly cleaned surfaces, time limits for welding are enforced. Wherever possible, wire-buffed high-strength joints are welded within 30 minutes after cleaning. If longer time limits are needed, as for assembly, the parts are tacked in place immediately after buffing. The time limit for completion of welding may then be extended to 24 hours without danger of objectionable re-oxidation.

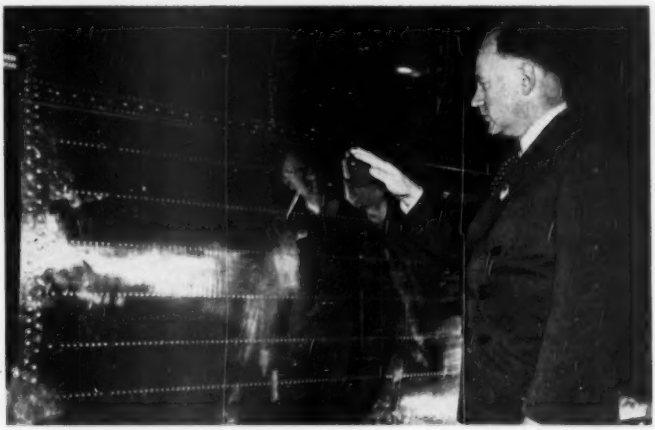
After cleaning, samples of each part are given an electrical surface-resistance test. Two sample pieces are placed between the electrodes of a testing machine, and a current of 100 amp is passed through them. A meter indicates the electrical resistance of the residual oxide film on the parts. The cleaning process is carefully controlled to keep the surface resistance of the representative samples below 21 microhms.

When the cleanliness of the surface has thus been electrically established, more samples are taken for single spot welds, made under the same conditions as if actual fabrication were taking place. The test pieces are torn apart on a shearing machine. One hand of the dial on this tensile tester shows the mounting shear

LOOKING DOWN the line in the welding department at some of the many spot and seam welders used by Boeing

ROLL-SPOT WELDING on aluminum sheets. Electrode wheels are halted at regular intervals for each spot

SET-UP FOR seam welding channel stiffeners to aluminum sheets



MIRROR FINISH of Strato Ships is scarcely marred by the neat rows of spots. Spot welds offer much less resistance to the air stream than rivets

load; another hand stops at the shear load under which the weld gives way. The shearing load must always be higher than the safe minimum standard required. It is usually the adjoining metal, not the weld, that breaks when the joint fails.

When the tests have been completed, we are ready for fabrication. This month's front cover pictures the weldors as they carefully align parts of body skin and weld them with one of Boeing's special machines.

During assembly and after welding, rigid inspection is the rule. Each part is carefully scrutinized for scratches, burns or other defects. From time to time, weld samples are taken to the metallurgical laboratory, where they are sawed in two, embedded in Lucite and optically polished. The metallurgical structure of the weld and adjacent metal is then examined under a powerful microscope.

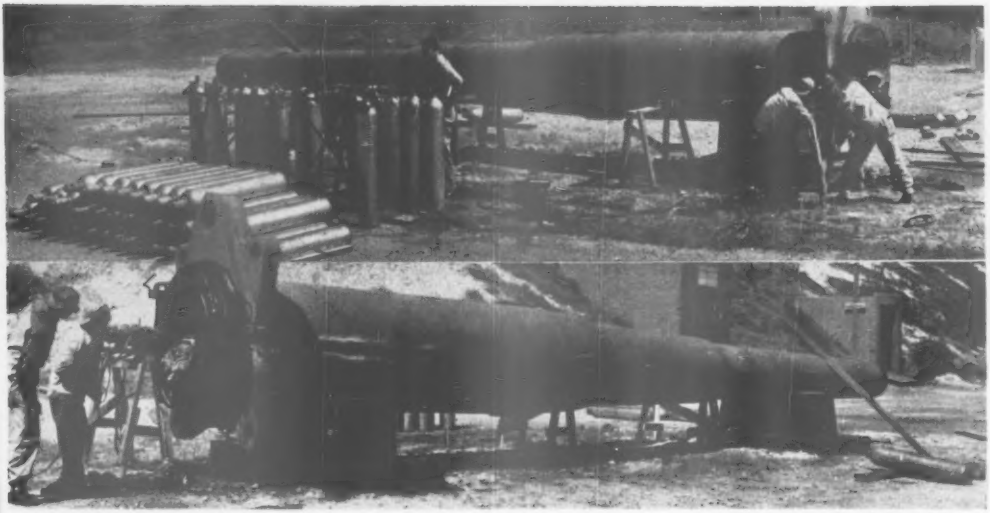
Careful study of production methods over a period of years, modified by laboratory evaluation, has established the proper settings for each type of material. Consequently, every welding machine in the factory bears a chart showing exactly how to set the controls so that the welds will come out perfectly.

Roll-Spot Welding

Seam welders are used to make long rows of spot welds (roll spots) on flat surfaces. A mechanical arrangement halts the electrode wheels regularly and for the split second that the spot weld is made. Amperage, pressure and hold time are all considered critical in aluminum spot welding. In a typical operation, high pressure is first applied between the electrodes to squeeze the parts together; a heavy current, at low voltage, is then passed through the electrodes and material.

Boeing has found its spot welds amazingly strong. In 0.040-in. aluminum alloy (used in body-skin lap joints), a single spot is required to exceed a shear test of 600 lbs. The Navy Air Force specification for welds in this gauge is only 345 lbs.

Through the use of spot welding for both structural and non-structural parts, stronger and sleeker Strato ships are being made by the Boeing Airplane Co.



U. S. Army Signal Corps Photos

GOING DOWN THE LINE to split a 14-in. gun barrel —one of Oahu's surplus seacoast artillery guns ordered by military edict to be scrapped. Hand torches will take over when the cutting machine has finished the splitting.

Hawaii Scraps

Death knell sounds for multi-million-dollar installation of coastal defense batteries, branded obsolete by military authorities. Here you can read how 41 barrels (some having 30-in. walls of laminated steel) were cut up.

BY W. R. LAURANCE
Sales Engineer, Hawaiian Gas Products, Ltd., Honolulu, Hawaii

FORTRESSES—even of the multi-million dollar type—are obsolete in modern warfare. Significant of the trend to more mobile defenses is the official edict—issued by the military after due consideration of the facts involved—condemning as obsolete the entire system of coastal defense guns on Oahu, the most important of the Hawaiian Islands. Pearl Harbor notwithstanding, none of the strategically located batteries had ever been fired against an enemy of the United States. It was the U. S. Navy and Marine Air Force who turned back the Japanese from the front door to Hawaii, in the battle of Midway, and so rendered the big guns unnecessary.

Listed among the guns scrapped were huge 14-in. naval rifles salvaged from the *Arizona* and *Pennsylvania* when these battleships were caught in the attack on Pearl Harbor. The largest guns scrapped were of 16-in. bore.

Ten Thousand Tons of Scrap

The big scrapping project included 41 separate gun barrels at the various sites, totaling approximately 10,000 tons of scrap and extraneous materials.

The size of this operation, plus the fact that a time limit of eight months was set for the completion of the job, made it compulsory to let the contract outside the Hawaiian Islands. It was awarded to the combined mainland firms of Paul Learner Ltd., Alameda, Calif., and Michael Flynn, Inc., New York City. Within a matter of days after their bid was accepted, the contractors had a well organized group of trained personnel on the job in Hawaii.

The large undertaking presented a challenge to the Hawaiian compressed gas industry. Estimates were that approximately 2,500,000 cu ft of oxygen and about one tenth as much acetylene would be consumed. These gas requirements were easily handled by the Hawaiian Gas Products, Ltd., familiarly known as "GASPRO." In addition to gas production and delivery problems, the Hawaiian firm also provided the equipment needed for specialized cutting. Finally, the gas company's welding engineers stood ready at all times to assist in the field on the technical problems that arose almost daily.

Manual and Mechanical Cutting

Among such technical problems were the rigging of the proper equipment to cut thicknesses of laminated steel up to 30 inches in the larger gun barrels and to cut turret coverings of 8-in. armor plate. A heavy-duty water-cooled cutting torch with a No. 28 tip was found adequate. The tip used has eight preheat orifices of 50 drill size (0.070-in. diam) and a

U. S. Army Signal Corps Photos

HEAVY-DUTY TORCH is mounted on a carriage that travels on a track lengthwise with the gun barrel. A manifold of ten cylinders is needed to supply the large amounts of oxygen consumed in cutting the thick steel

Its Big Guns

cutting orifice of drill size "K" (0.281-in. diam). Manifolds of ten oxygen and three acetylene cylinders were used with pressures of 85 psi for the oxygen and a maximum of 15 psi for the acetylene.

Some of these man-size torches were operated manually, but not all. On the heavier sections, especially in the splitting of the gun barrels, it was necessary to use cutting machines. Since this was a rush scrapping job, there had to be a certain degree of ingenuity and improvisation in utilizing equipment available in the Territory. We found that with proper counterbalancing we could mount the heavy-duty cutting torch on a light-weight motor-driven portable cutting machine of the type designed to cut straight lines, arcs and circles. The resulting combination has operated successfully through the heaviest cutting we have encountered on this job.

Oxygen Consumption

Our local engineers, it is also interesting to note, were successful in devising secondary manifolds with separate standard outlets. This enabled three cutting machines to be operated from each of the original manifolds of ten oxygen and three acetylene cylinders.

The large-size No. 28 cutting tip was used only on largest sections of the barrels. Oxygen consumption with this tip averaged 200 cu ft per foot of travel, cutting on thicknesses up to 30 in. Average speed of cutting was 2 ipm.

With the smaller No. 24 tip, a maximum thickness of 22 in. could be cut satisfactorily. This tip has six preheat orifices of 50 drill size (0.070-in. diam) and a cutting orifice of "C" drill size (0.242-in. diam). Oxgyen consumption averaged 9,272 cu ft for a 54-ft cut in material ranging from 14 in. up to 22 in. thicknesses. On the same cut, 1,000 cu ft of acetylene were consumed. Average cutting speed was 3 ipm.

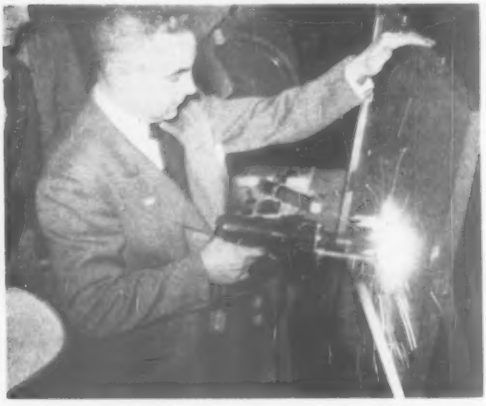
A complication encountered was that the gun barrels were laminated up to 4-in.-thick sections. After the barrels had been split by the heavy-duty cutting torch, the laminations were manually separated and cut by hand torches to charging box size of 5 ft by 18 in. The hand torches used cutting tips ranging from No. 3 size up to No. 12. No. 3 tip has four preheat orifices of 57 drill size (0.043-in. diam) and a cutting orifice of 0.0635-in. diam. No. 12 has eight preheat orifices of 56 drill size (0.0465-in. diam) and a cutting orifice of 0.221-in. diam.

The most hazardous technical problem encountered on this job was that of releasing the recoil spring mechanisms, but the chief difficulty that had to be overcome was probably the inaccessibility of the majority of the installations. The Island of Oahu has an approximate circumference of 90 miles, and the guns were installed perfectly from a strategic military viewpoint to command the shore line. From the viewpoint of scrapping, however, the installation was far from good. Many of the batteries were located on mountain tops and could only be reached by traversing several miles of seldom used dirt roads and trails.

At the present writing, after the first several months of this project, operations are definitely on schedule. We have every reason to believe that the contract will be completed well within the time limit.

KEY MAN in your success will be the manufacturers' representative. Deliver your invitation to him early

"SOMETHING GOING ON every minute" is the rule to follow when you are planning your clinic program



"LEARN BY DOING" is another good rule. Here is a customer who is getting the feel of a stud-welding gun

MOVIES ARE SHOWN every afternoon at the Omaha Welding Confab. It provides a welcome change of pace

So You're

No distributor in the country has enjoyed a better success with clinics than Omaha Welding. If you're not sure how to plan your own clinic, you can get the practical details here from Bill Schneiderwind.

By WILLIAM H. SCHNEIDERWIND
President, Omaha Welding Co.

EVER since 1935, Omaha Welding Co. has had an annual welding clinic—known as the "Omaha Welding Confab" throughout a nine-state area. We found out long ago that a welding clinic isn't something that you just decide to have and then do it. A lot of planning goes into a clinic, and the plans must be as carefully carried out as they are laid.

We think we've learned a lot about how to stage a welding clinic, but we are still learning every year. Here's an example of the sort of thing that experience has taught us:

Our early Confabs were held in March because we wanted them to take place before the spring plowing could begin. Many of our customers are in rural areas and wouldn't come if they were busy plowing. That was good thinking, but it didn't go far enough. We set the March date too early in the month, and our first Confabs were held to the almost inevitable accompaniment of bad weather. Finally, we got wise and picked a date during the last week in March—still in advance of the plowing season but not so early that our unheated warehouse is uncomfortable.

Are you going to offer any inducement to your customers to attend? That's another example of the sort of thing you have to take into consideration in your advance planning. Some welding supply houses I could name

HARD-TO-WELD JOBS brought by customers will put the experts on their metal to show they can be done

"LIVE EXHIBITS" are what you want. It's better to show a man how to do a job than to talk him to death

Going to Have a Clinic!

have drawn the crowds by providing food, beer, door prizes and so on. It costs money, but it seems to work: from the attendance standpoint such clinics are usually successful. I have often wondered, however, if the people come because they are really interested in welding or because they are interested in free eats and beer.

We like crowds, too, at our Confabs, but we want to be sure that the people there have come to learn something new about welding. So we don't provide any inducement other than one very inexpensive souvenir: a corncob pipe that we give to each visitor when he registers. Of course, there are always plenty of one-pound tins of tobacco around so he can smoke whenever he has the yen to.

Seven Simple Steps

We set up each Omaha Welding Confab on the basis of seven preliminary steps. They follow each other in chronological order, and all are of the utmost importance. Briefly, these steps are:

1. Make a general plan.
2. Decide on the date and place.
3. Invite manufacturers and other participants.
4. Prepare advertising.
5. Prepare a floor plan.
6. Organize personnel to handle the crowds.
7. Plan the program.

Step one, the making of a general plan, gets down in black-and-white just what it is we hope to accomplish at the proposed clinic. Once that's known, the subsequent steps seem to fall into logical sequence. Experience in putting on a number of clinics helps, of course.

The second step is to decide the date and place. In particular, the date is important—more important than it might appear to be on the surface. Is there anything else on the proposed date that might stop customers from coming? You will have to dig deep sometimes to find it out. In our case, as I have previously indicated, we have to steer between spring plowing on one hand and cold weather on the other. We try our best to set up our dates so the clinic will not be held while a Nebraska blizzard is raging. You won't get crowds if the weather isn't right. The ideal situation would be to have the weather good enough to permit our customers to make the Confab but just bad enough so that *their* customers won't be rushing them.

The location is not so hard to decide because there are very few alternatives. You can use your own store and warehouse, as we do: you can hire a hall at a central location, or you can have a traveling tent show going out to your customers. We have had some experience with the third choice, but we do not feel that it is the best way to conduct a welding clinic.

Inviting Participants

The third step is to invite manufacturers and others whom you want to participate in the clinic. These invitations must go out well in advance of the date of your clinic. You can't expect a manufacturer's representative to come to the clinic at a last minute's notice: these fellows are in demand. They must make up their schedules well in advance, so invite them early.

Who are you going to invite? It's up to you, but we always try to select the type of manufacturer who will do the most good for our customers. That's rather broad, but . . .

Do those we invite accept in large part? Yes, most of them do. Some plan actual demonstrations of equipment, while other manufacturers, whose products are not suited to demonstrations, content themselves with displays.

What does it cost them? The freight on products shipped in, the salaries of their representatives who put on the displays. We never charge rental for space, nor do we charge for power use at the Confab.

Our fourth step is to prepare ad-

LECTURES follow the movies every afternoon. Manufacturer's men are invited to discuss their products

STARTLING DISPLAYS, such as this giant wrench, are arranged when product demonstrations lack drama

vertising announcing the clinic. This is another activity that must be started several months in advance. At Omaha Welding, we usually start talking Confab in December, even though it won't be held until the last of March. We publish our own house organ, known as the *OWC News*. As soon as we have decided on the date of the Confab, we announce it in the *News* and keep on announcing it in every subsequent issue. As fast as manufacturers accept our invitations to attend, we publish the dope in the *News*. The house organ gives us an excellent opportunity to keep the Confab before our customers and does a great deal to increase attendance. We also use flyers, postcards and newspaper publicity.

We don't rely wholly on the printed word, however, in spreading the news about the Confab. All of our salesmen and sales engineers talk it up on any and every occasion. None of our men call on a customer or prospect without inviting him to be at the Confab. If he says he is planning on going, they give him help on where to stay, how to make the trip, etc. He's also asked to bring in a hard or unusual welding job that can be done during a demonstration.

Alloting Floor Space

One of the trickiest problems at any sort of exhibition is to split up the floor space. First of all you are going to have to know just how much space you are going to need. We at Omaha Welding are fortunate in that we have both a large display room and a good-size warehouse area that can be turned over to the Confab. As soon as the manufacturers have accepted our invitations, we can allot whatever space is necessary. We are now ready for the fifth step, that of preparing a floor plan.

The purpose of the floor plan is to assign booths and display areas to specific manufacturers for display and demonstration purposes. Sounds simple, but who's going to be next to whom? We solve it this way: manufacturers whose activities complement each other are arranged in booths close together; competitors are kept apart insofar as we can.

If you are not so fortunate as we are in having sufficient space to devote to your welding clinic, then supplement it if you can. Maybe there's some vacant premises you can rent, a garage building or something like that, or if there's a vacant lot nearby you might arrange to set up a tent. It's important to provide sufficient space to really do a job. Visitors are unhappy if they are crowded in an area too small for comfort or good visibility; they won't learn much, and they'll blame you for the discomfort. The clinic should be a breeder of good will not ill will.

The sixth step in the planning of the clinic is the organization of your personnel. The customers who come have to be made welcome and perhaps shown around; manufacturers' representatives have to be assisted in setting up their exhibits. They will want help on a multitude of such problems as where to store large shipping cases until after the clinic is over, how to get power connections, where is a table for sales literature and so on and so on. You must drill your men so that they will know what to do and will provide efficient and courteous service.

A good way to do it is to assign specific jobs to each member of the organization. Then there can be no passing the buck.

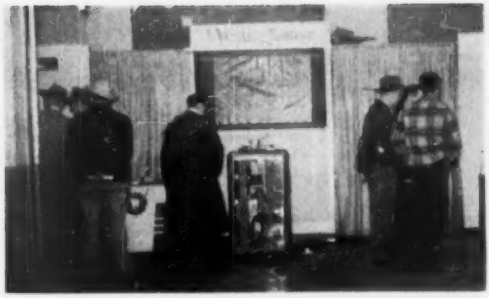
The seventh and final step is to plan the program. This step must be handled with considerable thought and care. People come to a welding clinic to learn, but the learning must be sugar-coated. To hold the interest of your visitors, information must go hand-in-hand with entertainment. This task of entertaining (without benefit of strip-teasers) can become quite a job, especially if the program extends over several days as does our Welding Confab. There must be something doing at all times.

Of course all of the people won't want to be taking in knowledge (even in sugar-coated form) all of the time. We feel, however, that it's quite important that there be something going on for those who do want it. The people who have done all the looking and walking they want to do for a time may be content just to sit on the sidelines and watch the crowds, but everybody isn't going to get tired at the same time. Hence, we have to see that there is always something going on.

How Long Shall It Last?

How long should your program be? That's a question that each welding distributor will have to determine for himself. Welding clinics can range from a day to a week. We have tried several lengths of programs and have finally come to the conclusion that a three-day affair is the most desirable. Three days allow a visitor taking the week off to have some time to himself to see the city, visit relatives and friends, etc. A five-day clinic would make him feel

ENTERTAINMENT is needed as well as instruction. Manufacturers can help you to keep customers amused



CURTAINED BOOTHS let visitors pick up a torch or an electrode holder and do an actual job of welding

that he was missing things if he took time out for personal activities, and a one-day clinic or even a two-day clinic wouldn't sound like enough to make a long trip for. Three days is just about right.

It's better to have the three days in the middle of the week than at either end. We start our Welding Confab at 9:00 a.m. Tuesday, run it until 5:00 p.m. on Thursday. The Tuesday morning start lets a manufacturer's representative leave home on Sunday night and get to Omaha Monday in time to set up his display. The Thursday closing allows him to dismantle the exhibit on Friday, so he can get home for a full week-end. That makes him a lot happier about attending the next Confab.

Our hours are from 9:00 a.m. to 5:00 p.m. on Tuesday and Thursday and from 9:00 a.m. to 9:00 p.m. on Wednesday. The Wednesday evening session is conducted for the benefit of weldors and others from local industries who have to work during the day and must look at welding equipment on their own time after working hours. It's nice to have the night session exactly in the middle.

The Confab program is planned so that most of the time is devoted to demonstrations of various welding and related processes. We like to have our space-holders put on "live exhibits"—*i.e.*, of the kind where the product is in actual use. It's better to show a man how to do it than to talk him to death. Of course, the visitor should always be able to ask questions and have them answered.

During the noon hour, we suspend all Confab activities so that everyone can get a bite to eat. That's better, we think, than to try to carry on short-handed. Beginning at 1:00 p.m. every day, an hour and a half is set aside for a lecture period. During this time, we show motion pictures and have manufacturers' representatives discuss the products they are displaying. After the lectures, the visitors again have the opportunity to witness actual demonstrations.

Welding Booths

We curtain off a portion of our warehouse area into welding booths so that our visitors may pick up a torch or an electrode holder and do an actual job of welding if they wish. Such booths give them the opportunity to try out a new rod or a new machine. Visitors who have been stumped by a particularly tough job often bring the work in with them to be mended or restored. Examples are hard-facing applications, the welding of die castings, etc. The manufacturers' representatives are put on their metal to prove that the job actually can be done. Experiences such as these make the Confab pay off as a long-term investment.

With the planning carefully done through the above seven steps, nothing remains for us to do but to stage the actual welding clinic. As soon as the clinic starts, an important job falls upon the shoulders of your personnel. Let's go back to point six, that of organizing your people.

Someone must be responsible to greet and meet the customers as they enter the sales room. It helps to have your visitors register so that they may be given badges with their names and addresses. Such badges certainly make it easier to call people by their right names and assist in the smoothness with which the clinic is conducted.

It's also a good idea to assign one or more of your men to work with manufacturers' representatives before the show starts and to assist them as the clinic is carried on. To set apart our own personnel from the visitors, we ask them to dress in white jackets. Our own men are thus easily spotted if a visitor wants assistance or has questions to ask.

What's the Good of It?

Now comes the $64 question: what's the value of a welding clinic? It is a difficult question to answer because you have no way of knowing just what the long-range benefits are going to be.

We sell a lot of actual merchandise during our Confabs, and afterwards we receive many orders that can be traced directly back to the last Confab. We have in our files many letters of appreciation from our customers. Our salesmen have received personal and highly favorable comments.

We have had as many as 1,700 people registered for the three-day Confab. Some of them have come as far as a thousand miles to attend. A great number of customers come back year after year. Many of our customers have never missed a Confab since the first one was held back in 1935.

Frankly, I believe that any time you can get up to 1,700 customers in your place of business, looking over the merchandise you stock, it is bound to be worth a lot of money to you in actual dollars and cents. We at Omaha Welding definitely feel that our Confabs are worth while. That's why we go on having them every year.

1—BODY FORMED of 12-gage Everdur sheets is welded at the longitudinal seam by inert-gas arc process

2—REINFORCING RING is fillet welded to body or casing. Ring was formed from ½-in.-thick Everdur bar

5—FOLLOW-UP to Fig. 4 is the welding operation to join the top ring to top of the Everdur beer filter

6—BOTTOM OF filter. The 3/16-in. circle of Everdur tops a steel circle flame-cut from ¾-in. plate

Inert-Arc Welding of

If you have to weld Everdur alloy, try inert-gas-shielded arc welding. It gives good welds even when the Everdur has to be welded to steel instead of to Everdur.

BY A. C. KRACKLAUER
President, Sparkler Mfg. Co., Mundelein, Ill.

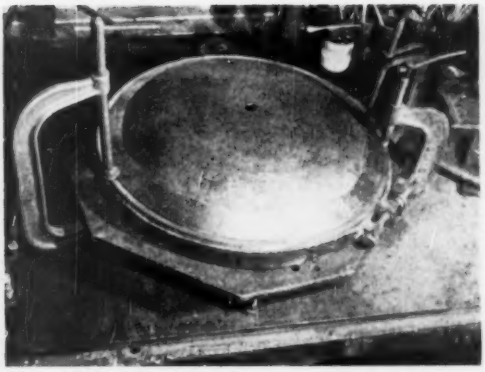
POLISHING beer in a brewery is nothing like "polishing off" a beer in a bar or grill. In brewing industry parlance, "polishing" is the final filtering operation that gives quality beers their uniformly sparkling appearance.

There are two ways to do it: either by the filtermass cake-type filter or by means of graded diatomaceous earth. The filtermass or pulp-type of filter has been used from way back. It operates on what is known as "depth filtration." The beer is passed through a rather thick and porous cake, which has multitudinous fibres to strain out the solids in the beer. Diatomite or diatomaceous earth is a silliceous deposit consisting essentially of the shells or skeletons of microscopic organisms known to science as diatoms. It resembles a fine-grained talcum powder but without the cohesive properties of talcum powder when wet. This unprepossessing substance is one of the best filtering agents known.

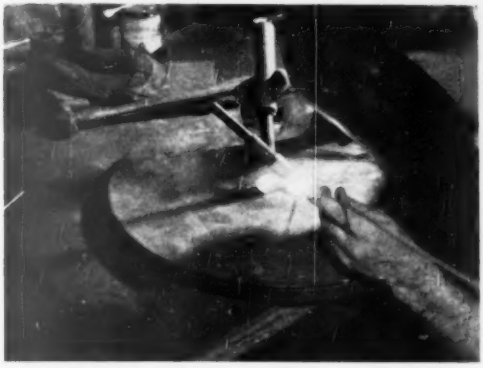
The diatomaceous-earth filter combines the principle of depth filtration with that of surface filtration. This excellent filtering medium is being used successfully and effectively in the chemical, pharmaceutical and food industries. Now it is being adapted to beer, for which it offers many advantages.

The costwise advantage of diatomite filtering has been found to

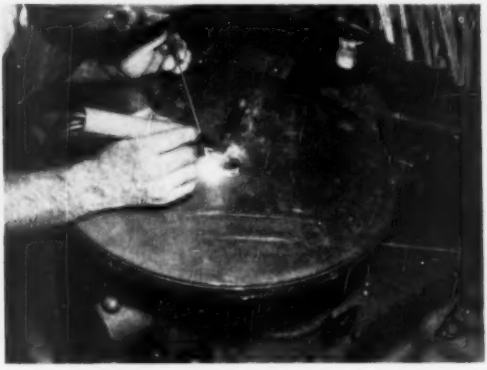
3—OTHER SIDE of reinforcing ring is welded. Note that the ends of the ring aren't yet welded together



4—SIMILAR RING is welded to top. Here's the jig designed to hold the top ring and top during welding



7—EVERDUR part of bottom goes on the inside. Here it's being welded to the steel plate at outlet opening



8—OUTLET PIPE, also of Everdur, is being welded to the Everdur portion of bottom. Note the shoulder

Everdur Beer Filter

amount to as much as 60 to 80%. Considering all factors involved, the cost of polishing in the average brewery runs from 0.035 to 0.04 cents per barrel. With the diatomite filter, the cost is reduced to 0.006 cents per barrel.

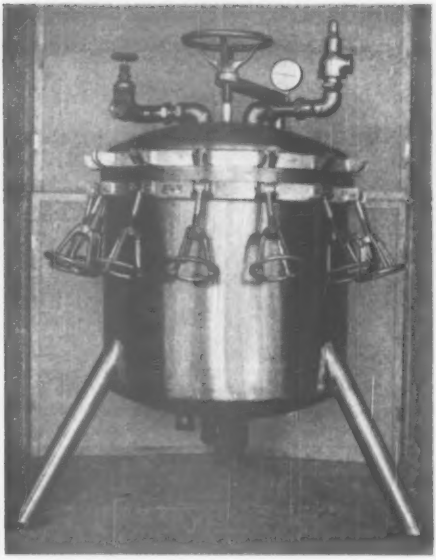
Ordinarily, the pressure vessel designed to retain the diatomite filter is fabricated of stainless steel. Recently, however, a brewer asked us to fabricate a filter case of Everdur, a silicon-bronze alloy. It must have been satisfactory, for the same customer has since put in an order for more Everdur filters. In appearance, Everdur is somewhat more in keeping with the copper equipment in a brewery, and the uniformity of materials eliminates the possibility of galvanic corrosive action caused by dissimilar metals.

The first filter (pictures 1 to 8) was sold to the Adolph Coors brewery, Denver, Colo., as a pilot plant filter. At the present time, it is being used for filtering water. The body, 18 in. in diameter, was formed of 12-gage Everdur sheets and was welded at the longitudinal seam by means of the inert-arc process (Fig. 1). Manual a-c welding was used with argon gas and a ⅛-in. Everdur filler rod. The seam was first tack welded and then butt welded with the added filler rod.

In Fig. 2, the casing reinforcing ring is being welded to the casing. This ring was formed of a ½-in.-thick Everdur bar. It took about 12 minutes to fillet weld it to one side of the casing with the inert-arc torch. Fig. 3 shows the fillet welding of the other side of the ring. The ends of the ring were left open until after the ring had been completely welded to the casing on both sides.

A similar ring was welded to the top of the filter. Fig. 4 shows the jig designed to hold the top ring and top for welding, and Fig. 5 the inert-arc welding that joined the two pieces. The top ring is also ½-in.

Photos by The Linde Air Products Co.



9—FINISHED BEER FILTER. This is a larger size but similar to the filter in pictures 1-8

10—PLATE CARTRIDGE assembly goes inside the filter to hold the diatomaceous earth that "polishes" the beer

Everdur, while the top itself was formed from a 12-gage stock.

Fabrication of the bottom of the filter involved the joining of two dissimilar metals: mild steel and Everdur. Fig. 6 shows the bottom assembly. The 3/16-in. Everdur circle fits on top of a ¾-in.-thick circle of mild steel. The operator is holding an Everdur outlet pipe about 2 in. in diameter.

The steel provided added strength and was less costly than a ¾-in. plate of Everdur would have been. No particular trouble was encountered in welding these dissimilar materials. Again, the inert-arc process was used with a ⅛-in. Everdur filler rod.

The steel goes on the outside; the interior of the vessel is entirely of Everdur. Fig. 7 shows the Everdur or inside part of the bottom being welded to the mild-steel plate at the bottom outlet opening. Plug welds were also used to hold the steel plate to the Everdur; these were made through a circlet of holes drilled through the steel.

In Fig. 8, the Everdur outlet pipe is being welded to the Everdur portion of the bottom. Note that the steel circle was flame-cut slightly oversize to leave a shoulder. The casing fits on this shoulder and will be inert-arc welded inside to the Everdur bottom and welded outside to the mild steel bottom of the filter.

Fig. 9 shows a finished Everdur beer filter of larger size than the one previously pictured. This filter is 33 in. in diameter and has a capacity of 200 barrels an hour. It was purchased by the Schlitz brewery in Milwaukee. Like the smaller 18-in. model, the 33-in. filter was 100% welded by the inert-arc process.

Fig. 10 is a view of the plate cartridge assembly that goes inside the larger filter. The lugs on the sides of the cartridges were welded by inert-arc as were the compression plates on each end of the assembly.

Claim an Inch—Prove a Mile

No. 7 in a series of inspirational talks on "Twelve Self-Assignments to Sales Success"

BY RICHARD C. BORDEN

EVERY TIME you bite off more claim than your proof can chew, you do a dangerous thing.

You weaken customer belief in ALL PARTS of your sales story . . . even those parts presented without lily-gilding.

This month, as your self-assignment, resolve not to let a single exaggerated claim escape your lips.

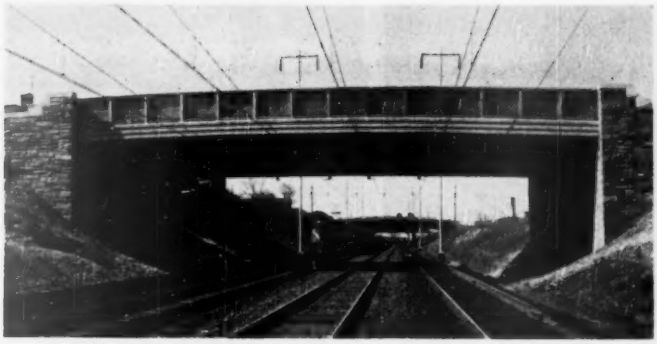
If one does . . . accidentally . . . correct the overstatement at once, on the spot. Do that without fail . . . and without exception.

Don't kid yourself into thinking that a "little" exaggeration, occasionally, is harmless. There isn't any such thing as *harmless* exaggeration! To quote one veteran salesman:

"What you intend to be just a little white lie usually winds up as a double feature in technicolor!"

This month . . . all month . . . make no exception to your application of the basic selling law: TO WIN BELIEF . . . DESERVE BELIEF!

These articles, published every month in THE WELDING ENGINEER, *are based on the script of a Dartnell-Borden series of sales films, "Selling against Resistance."*



SEVENTIETH STREET bridge in Philadelphia is a graceful, lightweight concrete arch over the tracks. Note the 91-feet-long aluminum guard rail

Courtesy The Linde Air Products Co.

BASE PLATE 1-in.-thick is welded to the bottom of vertical column

Steel was hard to get, so they designed an

All-Aluminum Guard Rail

BY J. I. MEDOFF

PHILADELPHIA's Seventieth Street bridge, a concrete-arch structure over the tracks of the Pennsylvania Railroad's main line near Paschall Ave., was designed when steel plates and structural shapes were in great demand and not-too-plentiful supply. It was therefore decided to fabricate the two guard rails from an aluminum alloy.

Material Details

The alloy selected was 61SW, a heat-treatable aluminum of 35,000 psi tensile strength. This material offers excellent corrosion resistance, good appearance and light weight.

The general contractor, the Kaufman Construction Co., subcontracted the fabrication of the guard rails to the William Keller Co. According to President William Keller, of the latter firm, these are the first all-aluminum guards to be welded by inert-arc welding.

Each of the two guard rails is 91 ft long, made up of 14 sections 6½ ft long and 5 ft high. The vertical supports are 6 by 6 by ⅜ in. H-columns. The side panels are ⅜-in.-thick "Diamond Tred" plates. Horizontal reinforcing at bottom is supplied by a 6 by 6 by ½ in. angle. Finally, the top is finished off with "Chevron" trim rail.

Keller combined welding and bolting in the fabrication. The rails were first assembled and welded in the shop, making due allowance for a 1-ft rise at the center of the span. Holes were drilled for field erection with 5/16-in. bolts. The rails were then disassembled and transported to the bridge site, where they were reassembled by bolting.

Fabrication Details

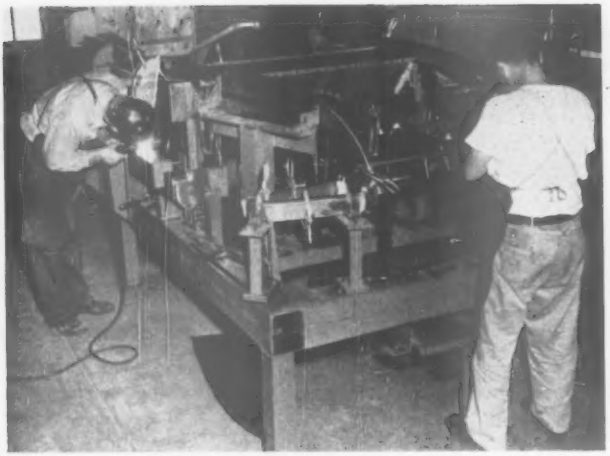
For bolting the vertical H-columns to the concrete foundation, a 1-in. base plate was welded to the bottom of each column. At the top end of the column, inverted-vee splice plates, ⅜ in. thick, were welded to the web. Two splice plates, one on each side of the web, provide support for the top cover member, another ⅜-in. plate. The ⅜-in. vertical side plate was welded to the 6 by 6 by ½ in. angle used for the bottom support and also welded to the inside of the top cover plate. Five fillet welds, each 3 in. long, were made to join a panel to the top or bottom support.

The weldors used manual inert-arc torches with argon shielding gas.

SIDE PLATE ⅜ in. thick is now being welded to the inside of top cover member

SPLICE plate is welded to the web of an H-column

FILLET WELDS attach side plate to bottom support, a 6 by 6 by ½ in. angle



1—JIG FOR FRAME assembly is 6 ft wide by 14 ft long and has 50 to 60 individual clamping stations—see construction in Fig. 2

2—TOGGLE-CLAMP fixture tilts back on swivel or forward against frame member

Building a Kurtis-Kraft

Aircraft production methods suggested the jig for frame assembly and the revolving trunnion in pictures above. Welding is confined to the flat position.

BY JAMES JOSEPH

ABOUT 75% of America's racing car bodies, both standard and midgets, are built within the walls of Kurtis-Kraft Company's two plants in Glendale, Calif. This year, for instance, nearly 80% of the cars that started qualification runs at Indianapolis had bodies of Kurtis-Kraft make. But what we want to talk about is the all-welded Sportscar.

A Custom-Made Auto

Designed by Frank Kurtis, the company's president and an expert in the design of racing bodies, the Sportscar has been getting national headlines. You can't buy it at a dealer's—yet: this car is custom-made to your individual order. The price? Oh, around $4,000 or so, depending on what modifications you ask for. Maybe you haven't got that kind of money for an automobile, but there are people who do. Kurtis-Kraft expects to turn out about 100 to 150 Sportscars this year.

The bodies are built by welding. A feature of the production line is a jig 6 ft wide by 14 ft long for the assembly of frame and supporting body members for welding. The jig was fitted up and welded together in the Kurtis-Kraft shop. As you can see from Fig. 1, it was made by setting heavy ship channel members on top of channel legs. Atop this support some 50 to 60 clamping stations are arranged. When the toggle clamps are loosened (after approximately 16 man-hours of welding), the entire frame assembly lifts out.

Each clamp fixture consists of a vertical channel with a flat plate welded on top of it and a bar 1 1/8 in. square on top of that. To the bar are bolted two vertical plates, each 1/8 in. thick, that are fillet welded to a center plate fitting snugly against the car's frame. All of this forms a pivoted fixture for the toggle clamp. Figure 2, a close-up of one of the toggle-clamp fixtures, shows how it tilts back on a swivel when it is not in service. Note the chain that fastens the clamp to the fixture.

About 90 major components are assembled on this jig and welded there to form the finished frame. There are also a number of subassemblies that are welded separately. Altogether, there are about 180 welds in the Sportscar's frame and body.

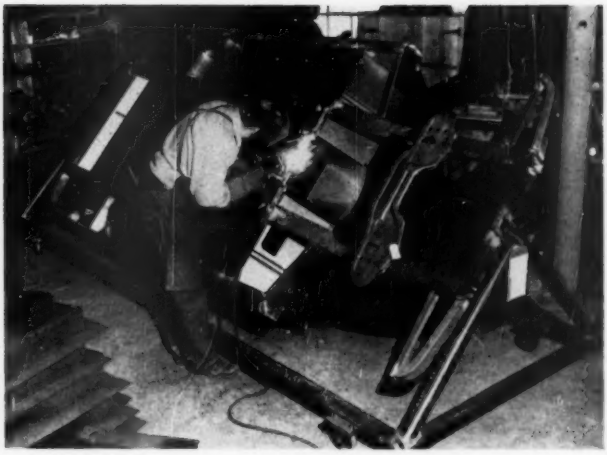
Weldors Work Outward

In the welding sequence, two weldors begin at the center of the jig and work outward. The heaviest steel is welded first. Frame members vary from 10 to 20 gage—all mild-steel sections. Light panels that reinforce the sheet steel supporting fenders and hood are the last to be welded.

Three welding methods are needed to make a frame: spot welding, inert-arc spot welding and arc welding. Spot welding of the ordinary kind is used for lap welds, arc welding for fillet welds. The inert-arc spot-welding gun (Fig. 3) is brought into play for hard-to-get-at spots that can't be backed. It's also used to join members of 18 or 20 gage to 12-gage members. The inert-arc spot welder usually gets its innings in final assembly stages of the Sportscar's frame. In the picture (Fig. 3) Foreman George Shilala is demonstrating how it is used on sheet-metal members.

Shop men agree that the cycle of the inert-arc spot welder is about twice as long as for a resistance spot

3—SPOT WELDING is done with inert-arc gun where back side can't be reached



4—REVOLVING TRUNNION allows touch-ups to be done on the underframe. Trunnion, made of 3-in. pipe, was put together in the shop

Sportscar

welder doing similar work. But the efficient jig operation has so minimized the overall welding time that the slower cycle isn't too objectionable.

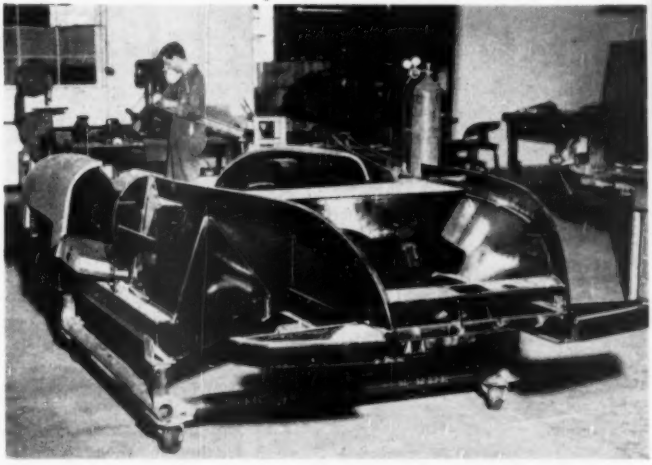
As for arc welding, well, 3 lb of electrodes of all types are used per car.

To Revolving Trunnion

When all welding is done, the 500-lb frame is lifted clear of the assembly jig by a light overhead chain monorail and placed on a revolving trunnion fixture (Fig. 4). The trunnion is made of pieces of 3-in. steel pipe, fitted up and welded in the Kurtis-Kraft shop. Both the trunnion and the frame assembly jig were modeled after aircraft production methods.

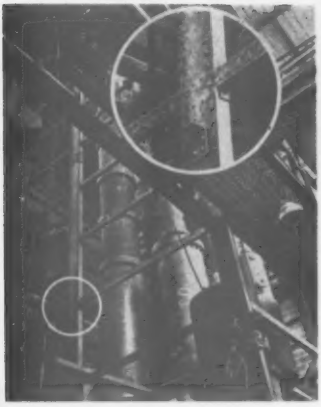
The trunnion or revolving rack is used for body fitting. It allows underframe touch-up wherever necessary. This fixture is 15½ ft long and 5 ft 2 in. wide—enough room to allow an entire frame to revolve easily within it. In Fig. 5, we see the final assembly stage in still another fixture.

A completed Kurtis-Kraft Sportscar is pictured in Fig. 6. It is 16 ft overall with a 100-in. wheelbase. Overall height, ground to top, is 51 in.

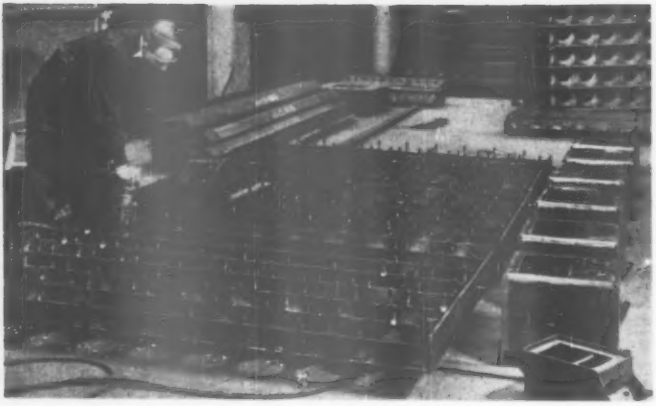


5—FINAL ASSEMBLY stage of the Sportscar before it goes to body shop

6—COMPLETED JOB: $4,000 worth or more of fancy-pants sport automobile



FOR COLD BOXES of gas-separating plant, Petrochemicals Ltd.



NEST OF DUST COLLECTOR cells stud welded with large studs at James Howden & Co. Ltd., Glasgow, Scotland. Steel studs 5/8 in. are used throughout

How Britain

The "Cyc-Arc" stud-welding process, invented in Britain, is now attracting attention on this side of the Atlantic. Here's the dope on how it works.

BY FRED BREWSTER
McGraw-Hill World News

Although the British "Cyc-Arc" stud-welding process is 30 years old, it has not been widely known in the U. S. Announcement of successful stud welding of aluminum to aluminum plate (THE WELDING ENGINEER, June p. 42) *by Cyc-Arc equipment—without any extra accessories and without the use of an inert-gas shield—has focused American attention on this process with a fresh interest. Here is a first-hand description from our London correspondent of how the Cyc-Arc process operates: what it can do and where it can be used.* —THE EDITORS.

STEEL STUDS up to 3/4 in. are now being welded to steel plates by means of Cyc-Arc equipment. This British stud-welding process also attaches studs of smaller diameter to very thick plates; *i.e.*, 1/8-in. steel pins have been welded to very thick armor plate in a fraction of a second. Studs of brass, Monel and aluminum have been shown to be situable for Cyc-Arc welding, too.

How Process Welds

Like any stud weld, the welding heat is produced by drawing an arc between the stud (or other attachment) and the plate to which it is to be secured. The arc is formed when the stud is lifted approximately 1/16 in., and it is maintained at the required current value for a predetermined time.

During the arcing time, the end of the stud is melted and a pool of molten metal forms in the plate beneath it. Towards the end of the cycle, the molten end of the stud is returned to contact with the melted parent metal, interrupting the welding current. Both the welding current and the sequence of operations throughout the welding cycle are controlled automatically, which insures uniform welds of consistent strength.

The whole welding operation takes from 1/10 of a second up to one second, depending upon the stud diameter (not plate thickness). Arc times are tabulated in Table I. A low-voltage d-c source is required. Operation of the controller requires an auxiliary power supply at normal lighting-circuit voltage.

Welding current control is effected by means of a heavy-duty contactor operated by a timing device. The operator adjusts it manually to select a welding time suitable to the size and composition of the stud and the parent structure. The timer also controls the operation of the welding tool.

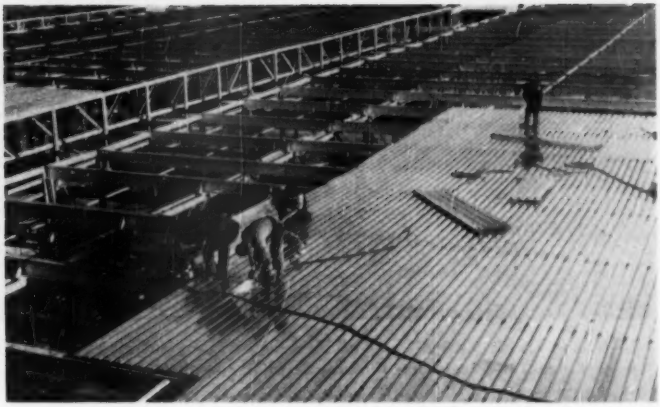
The Lift: Several types of welding tools are available—for portable use, for production-line work and for various special-purpose jobs. Their function is to hold and control the movement of the stud. At the beginning of the cycle, when the stud is lifted to create the arc, the lift is accomplished either electromagnetically or by means of fluid displacement effected by the movement of a solenoid-operated plunger. At the conclusion of the cycle, the stud is returned to the molten base plate by spring pressure. Damping is provided to eliminate excessive impact between stud and plate.

Where two or three stud-welding

Production

MOTORCYCLE mudguard staybolts, Birmingham Small Arms Co. Ltd.

Building



ALUMINUM ROOF DECKING being applied to ingot house, Steel Company of Wales Ltd., Margam, S. Wales. Photo courtesy William Briggs & Co. Ltd.

Uses Stud Welding

tools are being operated from a single generator, an interlocking relay unit can be connected into the control circuits to prevent the generator from being called upon to take the load of more than one tool at a time.

Pilot Arc: This recently developed and patented improvement is claimed to be one of the most outstanding advances in stud-welding technique. When the operator closes the switch that sets the cycle in motion, full voltage of the welding generator (at no-load condition) is applied between the end of the stud and the base plate. This serves to break down whatever moderate surface resistance may then exist at this point. Thereby it establishes suitable electrical conditions to permit a low-value prewelding current to flow for pilot-arc formation as the stud is lifted. As soon as these conditions have been created—and not before—the welding operation proceeds automatically. During the fraction of a second in which the stud is lifted away from the plate (before the full welding current is applied) the pilot-arc creates an ionized path on which the power arc is subsequently imposed.

This system is said to reduce surges on the generator, sometimes experienced with other welding equipment. The generator is relieved of the initial short circuit and consequent loss of power at the beginning of the weld, and its maximum peak-output is immediately available for the weld. Moreover, the welding tool is completely isolated from the welding-current supply until the switch is closed: the operator can handle it with perfect safety and can

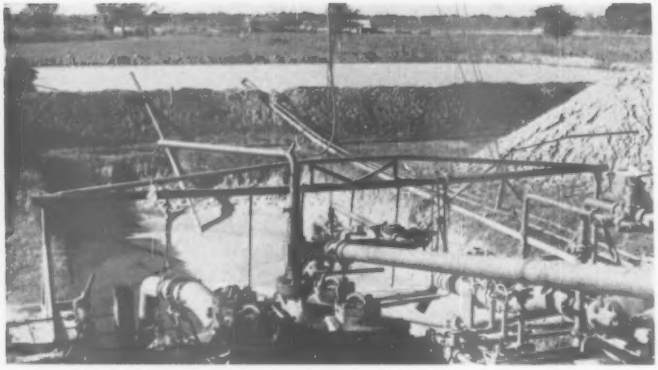
(*Continued on page 37*)

Table I. Approximate Arc Times and Current Settings

Stud Diameter, in.	STEEL		BRASS	
	Amp, (Transient)	Arc Time, Seconds	Amp, (Transient)	Arc Time Seconds
1/8	300	0.06	150	0.15
3/16	350	0.10	200	0.20
1/4	550	0.15	300	0.30
5/16	700	0.20	400	0.40
3/8	825	0.30	500	0.50
7/16	975	0.37	...	...
1/2	1,100	0.50	...	...
5/8	1,500	0.70	...	...
3/4	2,000	0.85	...	...
7/8	2,500	1.05	...	...

Railroads

WINDOW FRAMES of steel coach: British Railways, Midland Region, uses studs to secure the moldings.



1—TRUSS OVER MUD PIT was welded together to support the mud pump suction lines. It weighs 305 lb, supplants 620 lb of 4½-inch drill pipe

2—STOCK MAN rides the welded ladder to fill orders for parts

BY ELTON STERRETT

10 Jobs in

These "little" jobs in which welding was used for maintenance or to aid construction range from a truss to span mud pits to a platform for engine cranking.

Fuels derived from crude oil are the very lifeblood of the modern nation. Without oil for fuel, there could be no autos, buses, trucks, planes or Diesel locomotives; transportation would be limited to what could be carried by steam trains, electric railways and horse-drawn vehicles. Without oil, we would be plunged back overnight into the 1890's, and the result would be an indescribable chaos. But without welding, we could hardly produce oil in today's volume.

"Do it by welding" has long been the accepted practice of the oil industry. The welded fabrication of giant pressure vessels and thousand-mile pipe lines has been much publicized. Less well known, however, are the many little jobs in the oil fields in which a single weldor displays his ingenuity with a small amount of materials.

Last February THE WELDING ENGINEER *published an article, "13 Tricks for Better Operation in the Oil Fields," describing a baker's dozen of "little" jobs that ranged from simple door stops to a large tank for reduction of gas pressure. It was well received. Author Sterrett has now gathered together ten more such tricks for better oil-field operation. We think that you will find them interesting*—THE EDITORS.

1. Welded Suction Line Truss

THE WELDOR for a drilling contractor more than halved the weight of the support needed across one end of the mud pits to uphold the mud pump suction lines.

In place of the customary 4½-in. drill pipe laid between the two fittings at the edges of the pit, he substituted a welded truss. The bottom chord, weighing only 220 lb, was of 2⅞-in. drill pipe. The upper framework, of 1½-in. black pipe, was welded with intermediate bracing as shown in Fig. 1.

Holes were torch cut through the ends of the truss to match with similar perforations flame-cut in the halves of pipe couplings that served as supporting saddles. Bolts were then dropped through these matching holes to lock the truss in proper position to take its share of the load suspended beneath it.

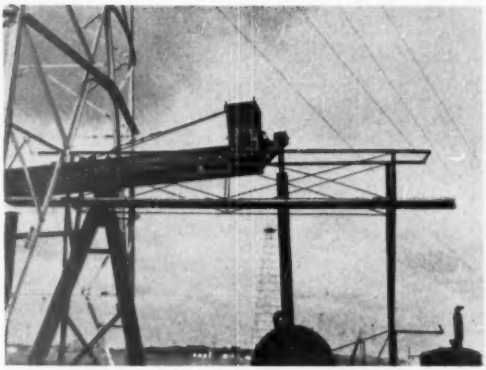
The improved truss member weighs 305 lb, as against 620 lb for the pipe it supplanted. The truss can easily be placed and removed by hand; a winch truck was required for the earlier type of support.

2. Rolling Ladder

THE WAREHOUSEMAN put in a request to the company weldor for a 10-ft ladder, to be made out of 1½-in. pipe and ¾-in. rounds. Instead of going to work and delivering exactly what was ordered, the weldor wanted to know for what purpose the ladder was to be used. He found that it was needed to give quick access to the storage bins in which replacement parts were sorted.

Instead of the original plan, the weldor came up with an idea for a rolling ladder (Fig. 2) that could be suspended from the top of the bin sections. It was mounted on a set of barn-door rollers at the top and on rubber-tired hand truck wheels at the base. The stock man can ride along the ladder and fill an order without any running up and down. Combination handrails and guards of 1-in. pipe were welded along the sides to keep him from reaching too far from one side of the ladder and risking a fall.

Coupled with a planned parts storage system, the movable ladder is estimated to reduce by more than



3—SCAFFOLD to reach the counterbalance on a well pumping unit can be picked up and carried by two men

4—RING GEAR for beveling torch is carried ready for service on a pipe unit of same size as line pipe

the Oil Fields

two-thirds the time formerly required to fill a typical replacement order.

3. Weldor Builds a Scaffold

MAINTENANCE MEN needed a scaffold to provide access to the counterbalance on an oil-field well pumping unit. The company weldor used some salvaged 2-in. pipe and short pieces of ⅝-in. sucker rod to make a sturdy frame. When planked over to form a walkway, it provided the pumping crew with a well-braced scaffold at the proper height for pump unit maintenance.

Figure 3 shows construction. Rounds ⅝-in. in diameter were used to form a double crossed truss; the intersections of the truss rods were tack welded to reduce vibration and eliminate chatter. The scaffold is carried on four 2-in. posts. It is light enough to be moved readily by two men, and strong enough to support both of them at the center of the span of 2 by 10 in. planks forming the walk.

4. Carrier for Beveling Torch

EDGE PREPARATION is a time-consuming part of pipe-line installation. To make the beveling torch readily available on the job, the weldor for one contractor mounted a short section of the line pipe—in this case 26-in. pipe—on the back of the welding truck (Fig. 4). He set it on braced feet that would clear the gap in the torch ring gear. The unit clamped on this carrier can be slid readily over the end of the truck. It can be as quickly clamped in place on the pipe joint to be beveled.

The space within the short pipe length is ideal for storage. The weldor blanked off one end of the pipe with a disc of thin steel and fitted the other with a hinged door. The door was mounted horizontally on a segment welded to the lower portion of the pipe. Padlock and hasp at the top completed a safe, weathertight locker in which the weldor could keep tips, goggles and other personal equipment.

5. Pusher Bumper for Trailer

PIPE-LINE CONTRACTORS sometimes meet tough going when they are moving equipment by truck and semi-trailer. It is frequently helpful to be able to push the trailer from behind. The weldor was given the job of designing a bumper for the trailer that would safeguard its wheels and properly protect the front of the vehicle doing the pushing.

He put together from heavy pipe sections a downward projecting bumper (Fig. 5) that hung below the rear panel of the trailer to a level approximately the height of the axle. This pipe structure, braced to the bolster and beams of the trailer, affords bearing for the blade of a dozer or the bumper of a truck being used to push from the rear. The welded pipe bumper is sturdy enough to absorb a stiff blow.

Since the trailer bumper extends only as far as the inner side of the inside wheels, it doesn't interfere with removal of the axle from the trailer. It also affords a convenient spot for the jack when a tire has to be changed.

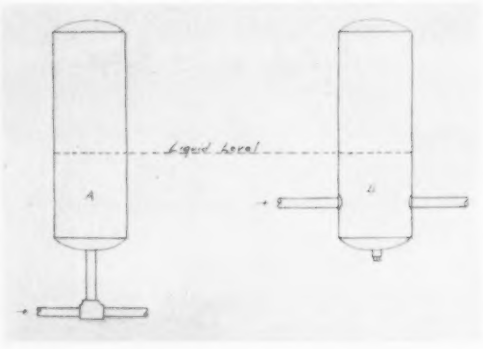
6. Cure for Water-Hammer

WHEN first installed, a surge tank was set as at "A" in Fig. 6. The air above the liquid level was supposed to check the pump pound as well as suppress the water-hammer present when certain of the line valves were shut off suddenly.

Because of the choke caused by the relatively slow flow at right angles to the main, the shocks were not entirely absorbed. Frequent valve replacements were needed.

The weldor was given the tank and told to replace the pipe fitting in the lower head with one of larger diameter. He came up with the suggestion diagrammed at "B." The entire flow is now carried through the

5—TRAILER can be shoved from behind by a bulldozer or truck. The pipe bumper takes the force of the blow



6—SURGE TANK arranged as at "A" required frequent valve change. Arrangement "B" ended water-hammer

9—ANVIL is anchored to a drum of 30-inch pipe filled with sand

10—PLATFORM for engine cranking is too heavy to be "borrowed"

body of the tank, and the full area of the cross-section is free to act against the air cushion.

All that he had to do to make the change was to weld two flanges to the side of the air chamber below the normal liquid line and lower the mounting of the tank so that the fittings thus placed would be aligned with the former level of the water delivery line.

7. All-Welded Oil Heater

IT IS FREQUENTLY desirable to heat oil as it flows from the well to enable water to be more readily removed. The weldor for one company improvised a heater utilizing a "Dutch oven" to prevent any actual contact between flame and oil-laden pipe.

Figure 7 shows how he made it. At one end of a 10-ft barrel of 10-in. pipe he welded a rectangular box long enough to hold a gas burner. The junction between barrel and box was made gastight. Then he welded the bottom of the box to a pair of $1\frac{1}{2}$-in. angles to serve as a base. At the front, the angles supported a pair of inclined pipe posts, which in turn supported the front end of the heater.

A disc of tank steel, pivoted at one edge, made a door to the burner for lighting it. At the end opposite the burner, the outer disc carrying the two oil lines was joined to a sleeve fitting snugly inside the barrel. Thus the oil-circulating unit can be removed without disturbing the heater.

8. Oil-Well Grating

LEAKAGE OF CRUDE OIL around the connections of fittings at the top of an oil well makes some kind of drain necessary. However, heavy loads must be supported when the well is being serviced, requiring a sturdy construction at that point.

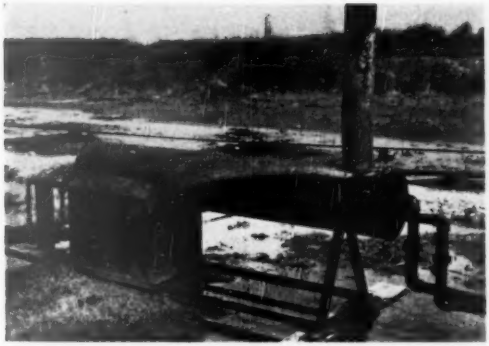
The weldor for one oil company met both requirements by fabricating a grille (Fig. 8) from salvaged $\frac{5}{8}$-in. rods. The open grating readily allows oil to drain through to the sump that surrounds the well fittings below the level of the concrete floor. Welded at every intersection of the rods, the grille is strong enough to take the load of any casing or tubing that may be rested on it during servicing.

The grille was formed in two pieces, being split so as to allow the well-head fittings to lie in one half. A notch in the other half carries the flow line. Being split into two parts, the grille may easily be lifted out when it is necessary to clean out the sump.

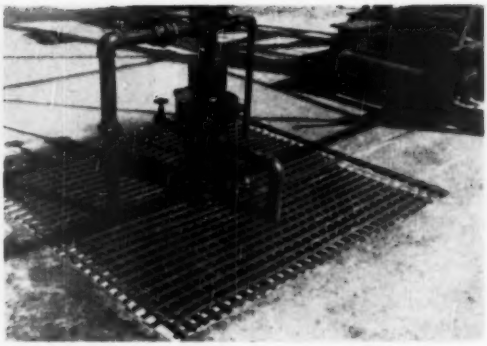
9. Anvil Mounting

PROBLEM WAS to tie down the anvil in the maintenance shop of a pipeline contractor. The weldor made a drumlike stand (Fig. 9) by cutting off a section of 30-in. pipe long enough to support the anvil at the proper striking height. This heavy pipe had 9/16-in. walls. A top cut from boiler plate of the same thickness was welded over one end of the pipe. The anvil was then secured to the boiler plate with two straps of $\frac{3}{4}$-in. reinforcing rod. These were formed to fit the anvil and welded to the plate between the feet of the unit.

When the mounting is used on a heavy plank floor, the rim of the pipe provides ample support. For concrete or on bare earth, however, the drum is fitted with a bottom or base plate. Before the second plate is welded into place, the drum is



7—HOW OIL is heated to aid water removal. Burner is in rectangular box; pipe barrel makes a Dutch oven



8—GRILLE at top of oil well allows drainage. It's welded at every intersection of the ⅝-in.-diam rods

filled with dry sand. Since it holds more than 5 cu ft, the sand ballast weighs over 500 lb—ample to anchor the anvil mounting wherever it's placed.

Suppose that the anvil is to be hauled a considerable distance to a new shop site. The weldor then torch cuts a hole in the cylinder to allow the sand to be emptied. New sand is added at the new location, and a plug is welded into the vent.

10. Improved Engine Starting

TO PROVIDE proper belt clearance for an oil-field pumping unit it was necessary to mount the gas engine too high for convenient cranking. So the company weldor was called in to make a platform for cranking the engine more effectively (Fig. 10).

The weldor tied together four 24-in. lengths of 10-in. I-beam to form a square, atop of which he bolted two short pieces of 12-in. timbers for a platform. The platform was exactly at the proper height for best operation of the "Armstrong" starter. The stand was not only heavy enough to insure a good footing but too heavy to be dragged away to provide additional "reach" elsewhere.

To assist the lease tender still further, the weldor fabricated a triangular outboard bearing for the crank. This was cut from a short section of tank plate as shown in the picture. A 2-in. flange was turned all around, and welded at the lines of contact. The triangle was then bolted to the T-slots of the engine base, and a bearing was put on it to carry the crank. The light plate, reinforced by the welding, is amply strong to withstand cranking stresses and is readily removable when the engine has to be serviced.

BRITISH STUD WELDING

(*Continued from page 33*)

insert studs into the chuck without any danger of getting a shock.

ACCESSORIES, WELDING TIMES

An inert-gas shield is never required for any material. A ceramic ferrule around the base of the stud is used sometimes but not always: it is used with aluminum studs but is not needed with steel studs up to ½-in. diameter when welding downhand. However, ferrules are desirable to contain the molten metal when studs larger than ¼-in. diameter are welded overhead or in the vertical plane.

Actual welding times are very short. Table I gives both arc times and current settings for studs of various diameters. For steel studs from ⅛ to ⅞-in., arc times range from 0.06 to 1.05 seconds; current settings from 300 to 2,500 amp. For brass studs ⅛ to ⅜ in., arc times range from 0.15 to 0.50 seconds and current settings from 150 to 500 amp.

Stud welding makes possible considerable savings in materials over conventional methods of attaching units like clips, threaded pieces, etc., since the thickness of the parent-metal plate can be less than it would otherwise have to be. To develop the full strength of a steel, the base-metal plate need be no more than one-third the diameter of the stud. A plate or flange that has to be drilled and tapped for a screwed-on stud is usually required to be at least as thick as the stud diameter. Under suitable conditions, steel studs of diameter five times the thickness of the plate have been satisfactorily welded. In such extreme cases, however, it is usually desirable and necessary to make use of a copper back-up plate to absorb heat from the weld zone and prevent excessive penetration.

MECHANICAL STRENGTH

Cyc-Arc standard steel studs are manufactured from mild steel produced and heat treated to give the physical properties required. The end to be welded is formed into a cone shape (which registers easily on centerpunch markings) and subsequently metallized—a patented process.

The ultimate tensile strength is 56,000 to 64,000 psi, with elongation and reduction in area the values normal to steel of this quality. Under the commonly used methods of mechanical testing (several good stout bashes with a hammer), the welds have proved far stronger than the stud itself, which invariably fails (in tension) well above the weld zone.

As there is no perforation or weakening of the parent metal structure when stud welds are properly applied, they can be used in places where the vessel must be kept gas-tight or liquidtight.

The pictures show interesting applications of this British process to British industry.

STEP 2 (after metal is cleaned, Jar 1) is to brush on the red dye

STEP 3: cleaner (Jar 3) removes all of the red from the surface

STEP 4: white developer (Jar 4) is applied to bring out the flaw

Dye-Penetrant

Speedy new test detects surface flaws in welds even if they're no bigger than a hairline crack. Maybe this method is what you need to save money on inspection.

BY JAMES JOSEPH

RED is the telltale color that reveals surface flaws in welds unseen by the naked eye. For red is the color of a metal penetrant, important part of a new inspection process called "Dy-Chek" or dye-penetrant method (DPM for short). Surface cracks and surface welding flaws are quickly detected by this new method of non-destructive testing.

Invented at Northrop Aircraft

The new process was originated by Northrop Aircraft, Inc., Hawthorne, Calif., during research and tooling for its 10,000-hp gas-powered turbine. The need was for a quick, sure method to check for flaws while the parts were assembled. X-ray, ultrasonic, magnetic-particle or fluorescent-penetrant inspection all required removal of the parts from the assembly.

The DPM system employs four chemical solutions: at Northrop, these are supplied in four numbered jars in a convenient kit. Jar No. 1 contains a surface cleaner for the metal. Jar No. 2 holds a scarlet penetrant liquid of unusually high capillary action and correspondingly low surface tension. Jar 3 holds a volatile solvent to remove the penetrant from the metal's surface after application. Jar 4 contains a white developer, quick-drying solution that provides a white background upon which the flaws show up as scarlet lines. The developer also serves to draw out the penetrant from where it has gone below the surface. To use this inspection kit, the liquids are simply applied to the work in the numbered order.

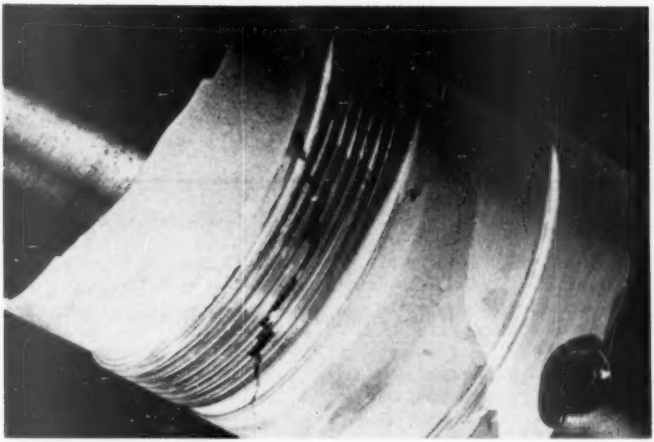
Bringing out the Flaws

The penetrant dye will find its way through unseen hair-thin flaws and work through them, from one below-surface abnormality to another. It is probably the most probing of all known penetrants and was developed by Northrop chemists and metallurgical engineers, among them Rebecca H. Smith, chief metallurgist for the Turbodyne Corp., a Northrop subsidiary.

After cleaning the surface of the metal (Step 1), the red penetrant is applied to the welded surface to be inspected (Step 2). It is allowed to penetrate from 5 to 15 minutes, depending on the metal under test and the suspected thinness of the crack or flaw. The volatile solvent is then used to wash the surface of the inspected area completely clean of the red penetrant (Step 3). When the surface is dry, the area is lightly painted with the white developer (Step 4).

As it drys, giving a white background, the developing chemical "bleeds" out the red penetrant. The outline of the flaw begins to show vividly on the white developer background. Through practice and use, a weldor can estimate the extent—depth—of the flaw by the amount and shape of the red path showing up on the white background.

There are some limitations to this method. In the first place, it can locate only the flaws that are actual discontinuities on the surface. Thus internal porosity cannot be found unless the cavities extend to the surface. There must be a path—no matter if only a hairline—through which the penetrant can make its way. Slag inclusions, even when present on the



FLAW IS REVEALED as a scarlet line against the white background. The distinct fissure across the threads couldn't be seen by the unaided eye

Inspection

surface, will not give indications because they are solid and offer no crevices for the dye to enter. If the inclusion has caused a crack, however, the dye will show it up.

Because surface flaws stand out so vividly, this inspection method is especially valuable where defects are obscured by sharp radii. It can check any welded part that can be seen and reached. Such automotive parts as crankshafts, pistons, heads, connecting rods and valves are quickly checked for surface defects.

Tests Oxygen Regulator

One Northrop weldor recently put the DPM process to good use. He was unable to make the gas mixtures in his torch remain constant, so he removed the regulator from his oxygen cylinder and checked it with the dye penetrant. The cracks in the brass casting showed up vividly, but they couldn't be seen by the unaided eye because they were in the radius. Yet one crack was so wide that the red began to ooze out even before the developer was applied. A line of red dots on the outer surface proved that crack extended through the entire section of the regulator. This amply explained the oxygen leak and subsequent loss of pressure.

The penetrant works equally well on magnetic and non-magnetic metals. You can use it on steel, stainless steel, nickel, nickel alloys, magnesium, titanium, copper, brass, aluminum, aluminum alloys and cobalt.

Interpretation of the telltale red as it is drawn from the flaws needs a little practice. A red line indicates a crack or cold shut; a series of red dots in a line indicates a tight crack, cold shut, or partially welded lap. The extent of the opening may be estimated by the width of the indication or by the amount of spreading of the red penetrant on the white developer. Red dots indicate pits or porosity. A diffused pink color means carelessness: the penetrant wasn't cleaned off before applying the developer, or else the part was not adequately cleaned of dirt and scale, or the developer may have been improperly applied.

Dye Check a Double Check

Northrop does not recommend application of the penetrant process as a substitute for other inspection methods. Each has its proved place. But "Dy-Chek" is always good for double check. And in many cases, it has been used to do all the checking.

For production inspections, you can dip the parts or spray them with the solutions. Ordinarily, it is enough to paint them on with a brush.

One of the chief advantages of the new inspection method is that purely surface deformities don't show up. To give a positive indication, a defect has to extend below the surface as all dye was removed from the surface (Step 3) before the developing solution was applied. The dye check treats purely surface disconformities as flawless areas.

Northrop has found many welding applications: for instance, stainless-steel turbine nozzles. These were inert-arc welded to the stator rings of the turbine engine by one of Northrop's most expert weldors. The welds seemed sound to the naked eye. Even under a powerful magnifying glass, no flaws could be seen. Yet cracks showed up when the penetrant was applied to the welds.

Aluminum lugs were being welded on aluminum base metal on the Northrop flying wing aircraft. Again, the inert-arc process was used. One weld passed inspection by other methods—but the penetrant indicated a dangerous crack. The weld metal had to be entirely cut away, and the lug rewelded.

Carbide bits that have been brazed or welded on other bits may be checked to see if their tips are cracked. Still another application is to check the adhesion of a brazed overlay applied to carbon steel. The penetrant method can also be used to detect surface cracks in the seams of pressure vessels and pipe lines.

Where It Won't Work

There are a few cases where the penetrant method is not applicable. It is no good, for instance, on rough, porous gray-iron castings; the penetrant will seep right through the porous surface—and give indications of flaws.

The dye-penetrant method does not really compete with the X-ray, gamma-ray, ultrasonic and magnetic-particle inspection methods—all of which can find subsurface flaws that do not reach to the surface. But DPM works equally well with both magnetic and non-magnetic metals.

The Dy-Chek Co., a division of Northrop Aircraft, Inc., has been organized to market quantity production sizes and portable inspection kits.

1. Penetration Hardness
2. Body Strength
3. Attrition Resistance

New Concepts

Table I. Hardness Values of Abrasives

Material	*Mohs Number*	*Typical Knoop Hardness*
Quartz (as silica sand)	8	800
Aluminum oxide	9	2,000
Silicon carbide	9+	2,500
Boron carbide	9+	2,800
Diamond	10	Greater than 7,000
Glasses (depending on composition)	..	300 to 500
Hard steel, Rockwell C 60.5	..	740
Cemented carbides	..	1,400 to 1,800

Table II. Attrition Resistance of Four Abrasives

	On Hard Carbon Steel	*On Hard Cast Iron*	*On Glass*
Aluminum oxide	high	moderate	very low
Silicon carbide	moderate	high	high
Boron carbide	low	low	moderate
Diamond	very high	very high	very high

Table III. Suitability of Abrasive Properties

	Soft and Hard Steels	*Hard Cast Irons*	*Ceramics and Stone*
Aluminum oxide:			
Body strength	suitable	suitable	too high
Attrition resistance	suitable	too low	very much too low
Silicon carbide:			
Body strength	too high	suitable	higher than optimum
Attrition resistance	too low	suitable	suitable
Boron carbide:			
Body strength	too high	too high	too high
Attrition resistance	very much too low	very much too low	too low
Diamond:			
Body strength	suitable	suitable	suitable
Attrition resistance	excellent	excellent	excellent

# of Abrasive Properties*

BY H. W. WAGNER
Research Engineer, Norton Co.

HARDNESS is the property of abrasives with which we are most acquainted. The abrasive should be harder than the work it grinds in order to penetrate the work and remove chips from it.

"Toughness" (body strength) or resistance to fracture under the impact of grinding is another property sometimes discussed.

Dulling of abrasive points in grinding, which leads to a glazed† wheel face, has been commonly considered as depending on the hardness of the work relative to the hardness of the abrasive. Aluminum-oxide abrasive glazes more readily on hard cemented carbide than on soft steel because the carbide is harder than the steel. Aluminum oxide glazes more rapidly on glass than does silicon carbide because aluminum oxide is the softer of the two abrasives.

Solubility Effect

Such reasoning is correct insofar as it goes. However, recent experiments have revealed that point dulling (and glazing) is also affected by the chemical nature of the abrasive as related to that of the work. For example, silicon carbide and boron carbide are both harder than aluminum oxide. Yet both of these abrasives dull more rapidly on hard steel than does aluminum oxide. The explanation is that the two carbide abrasives are more soluble in steel than is the aluminous abrasive. As another illustration, aluminum oxide when grinding glass dulls at a rate far too rapid to be explained by relative hardness: the penetration hardness of glass is much lower than that of aluminum oxide and is even lower than that of hard steel. The explanation is that this abrasive is soluble in glass.

The solubility of the abrasive in the work should not be pictured as a rapid action—not anywhere near so pronounced as the dissolving of sugar in hot coffee. It is more like the reaction of ice on salt, but still at a much slower rate. If the point of a crystal of rock salt is rubbed on ice in a temperature well below the melting point of ice, the point of the salt crystal will be worn down because a solution of water and salt is produced at the contact. Pressure and heat derived from friction are contributing factors.

Two New Concepts

The first of our new concepts is the one just described. Dulling of the abrasive points (and glazing of the wheel) is affected by solubility of the abrasive in the work material as well as by difference of hardness between the two materials. The solubility effect is accentuated by high pressure and high temperature at the contact of the abrasive point and work. Resistance to dulling from the two causes combined is called "attrition resistance."

The other new concept is that aluminum-oxide abrasive is not "tougher" than silicon carbide. This statement is contrary to the older, traditional idea. However, reasons for the earlier concept are obscure, and recent observations lead to the conclusion that aluminum oxide is more easily fractured in grinding than is silicon carbide.

Ease of Fracture

Ease of fracture of an abrasive is a function of body strength, which is important in grinding. If body strength is too low, the abrasive will be wasted away by crushing. If body strength is too high, entire dulled grains must be torn out bodily and be wasted in order to resharpen the cutting face. The ideal strength is that which permits fracture and resharpening when, and only when, the grain point is partly dulled. Such fracture causes loss of only part of the grain and permits the sharpened remainder to do more useful cutting. Fracture is helpful also in shedding "load" particles of the work that cling to the wheel face and interfere with grinding.

Three abrasive properties are now recognized as of major importance in grinding:

1. Penetration hardness
2. Body strength (and other fracture characteristics)
3. Attrition resistance

We will now consider each of these three properties in detail.

1. Penetration Hardness

This property of abrasives is measured by the Tukon tester and is expressed as a Knoop number. The principle of measurement is similar to that of the Rockwell machine for metals. The Tukon instrument employs a diamond penetrating point ground to a particular diamond shape.

Incidentally, I might point out that the Knoop hardness numbers are generally in the same order as Mohs hardness numbers for minerals. Mohs numbers are determined by scratching one material with another. The higher number, the greater is the hardness. The diamond is at the top of the scale with a number of 10.

Hardness numbers for some abrasives and for some substances ground by abrasives are tabulated in Table I. The Knoop numbers are for a 100-gram (3½ oz.) load on the point penetrating the specimen.

2. Body Strength

Ratings of relative body strengths (toughness) of four abrasives are:

Aluminum oxide.....moderate
Silicon carbide ....moderate plus
Boron carbide .....high
Diamond .....very high

These rankings are in the same order as those of penetration hardness, a logical relationship.

Rankings of both properties are for the dense basic abrasive, unaffected by joints between crystals, shape of grain, etc.

†The wheel face is said to be glazed when the abrasive points in cutting position are blunted because flats have worn on them. The flats may or may not be coated with a thin film of the metal being ground.

*Courtesy *Grits and Grinds*

Courtesy Allis-Chalmers

TO GRIND STEEL, either mild or high carbon, the best suited abrasive is generally aluminum oxide. For hard cast iron, silicon carbide is best

3. Attrition Resistance

ATTRITION resistance, previously referred to, is the property that resists attritious wear or dulling of the abrasive point by loss of extremely fine particles. Greatly magnified, the action can be likened to the normal wear of chalk when you are writing on the blackboard. If the stick of chalk breaks, however, that is due to low body strength and has nothing to do with attrition resistance.

Rate of attritious wear has been related to hardness of the abrasive, hardness of the work and solubility of the abrasive in the work. No accurate separation of the effects of these factors has been made. Consequently, ratings of the property now under discussion involve the combined effects of all these factors. Table II presents such ratings for four different abrasives when used for grinding three work materials. They were determined with fixed abrasive points, applied to the work at equal pressure.

Relative rankings are among the abrasives on the same work material, not necessarily for the same abrasive on different materials.

Suitabilities for different types of work are estimated in Table III according to present knowledge of two properties of four abrasives: body strength and attrition resistance. Penetration hardness is not listed separately here because its effect is included under attrition resistance. Body strength is in reference to the strength needed to accompany attrition resistance on the respective work material, rather than in comparison with another abrasive.

Classifications for grinding cemented carbides would be much the same as for ceramics and stone.

HOW TO PICK AN ABRASIVE

The overall relative suitability (fitness) of an abrasive might be measured by the amount of work ground during the life of the wheel when the grade (wear resistance) of each abrasive is so chosen as to require the same power to drive each wheel in a precision (fixed feed) grinding operation.

Looking over the table, we see that aluminum oxide is most suitable for soft and hard steels, silicon carbide most suitable for cast irons, boron carbide suitable for neither and the diamond suitable for all work listed.

Boron carbide has found many successful applications in industry: liners for sandblast nozzles, a lapping abrasive for cemented carbides. Such success is due to its high hardness and high strength among abrasives and, when molded, to its high resistance to mechanical abrasion. An abrasive grain turns while lapping so that all points of the grain come into play. But when boron carbide is fixed as in a grinding wheel, it is not successful as a grinding agent.

Top suitability of the diamond does not necessarily mean that it is the most economical on all materials. Its high cost and the problem of bonding it prevent it from being relatively economical for grinding many metals. Its practical value has been demonstrated most definitely in grinding hard, non-ductile substances such as ceramics, stone and cemented carbides.

There are, of course, exceptions to the estimates of Table III. Silicon-carbide abrasive is frequently employed for cylindrical rough grinding of 18-8 (soft) stainless steel. Aluminum oxide is sometimes used for stock removal of glass, although the stock removal here is regarded as accomplished more by rubbing and less by penetration of the abrasive into the work than occurs in most grinding.

When the object is to finish grind, low attrition resistance and glazing of the wheel face may become an asset. This is exemplified by the use of silicon-carbide wheels for putting a "mirror" finish on hardened steel rolls, and by the use of aluminum-oxide wheels for putting a fine finish on glass preliminary to polishing.

SUMMARY

An abrasive yields higher grinding value when:

Its penetration hardness is higher.

Its body strength permits fracture (self-sharpening) of the grain at the proper degree of dullness.

Its attrition resistance is higher in contact with the particular work material being ground.

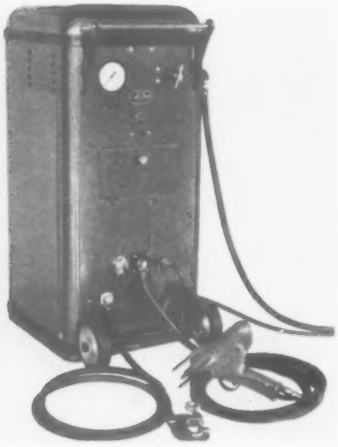
The two new concepts discussed are restated as follows:

1. Aluminum oxide abrasive fractures somewhat more readily than does silicon carbide in grinding.

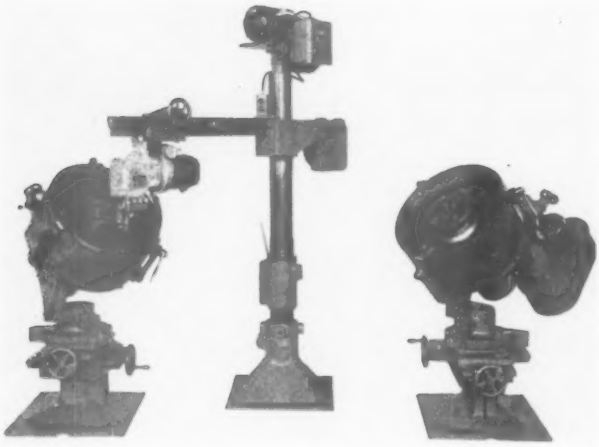
2. Dulling of abrasive points is influenced by solubility of the particular abrasive in the particular work material being ground.

TEMPORARY ADDRESS – GARDNER DISPLAYS, 1937 W. HASTINGS ST., CHICAGO, ILL.

New products



PORTABLE STUD welder draws less power than home flat iron from 110, 220 or 440 volt a-c outlets



POSITIONER for automatic welding head can be used with two jigs for almost continuous welding. The swinging arm locks in position over each jig. Jigs have cross-slide adjustment

Portable Stud Welder Uses Condenser Power Unit

THE new Graham portable stud welder brings to the shipbuilding, construction and automotive industries the advantages of fluxless stud welding without special power sources. The 20 by 20-in. square control and power cabinet can be located anywhere that 110, 220 or 440 volt-a-c current and air pressure are available.

Graham claims that the wattage pull is less than that of a home flat iron. The cabinet contains condensers that are connected in various combinations to provide the proper current for different studs or materials.

Studs used by this new welder have only a small projection or tip on their ends. When this tip contacts the workpiece an arc jumps across the gap and ionizes the air and surrounding metal. This ionization is claimed to cleanse both surfaces better than flux. The arc melts the full diameter of the stud and a similar area of the workpiece. A hammer blow completes the weld.

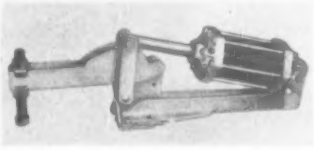
Some of the metals that can be welded with the Graham process are steel, steel to brass, steel to stainless, aluminum to zinc die cast, copper to steel and nickel to steel.

An advantage claimed for the process is the elimination of training programs for help. Once the proper air pressure is set on the control and the proper combination of condensers is hooked up, welding can proceed indefinitely. A safety feature is that the gun has to be in contact with metal to weld the stud.

The control cabinet may be moved around in ship holds, etc., by an eye-bolt (not shown above) on the top of the case.

GRAHAM MFG. CORP., 1541 East Eight Mile Rd., Ferndale 20, Mich.

* * *



Two New Air Clamps Brought out by Lapeer

CLAMPING forces of 200 and 1,200 lb are available with two new Lapeer air-operated clamps, the AO-200 and the AO-1,200. The toggle bar in each is channel-shaped to permit the spindle to be moved along its full length to accommodate work. The force is increased to 475 and 2,875 lb for the clamps if the spindle is moved close to the base of each clamp. Air pressure for either clamp is 85 psi max.

LAPEER MFG. CO., Lapeer, Mich.

Continuous Welding With New Automatic Positioner

HIGH production automatic welding can be achieved with the Acme automatic welding positioner coupled with two jigs. One jig is loaded or unloaded while the other jig is under the welding head.

The positioner has a vertical power traverse with up and down "inching" button. The arm holding the welding head swings from one to the other and locks in place. A hand wheel on the carriage offers further adjustment to particular welding conditions.

The jigs can be set in either vertical or horizontal position and have a cross slide adjustment for fine settings.

ACME MFG. CO., 1615 Howard St., Detroit 16.

* * *

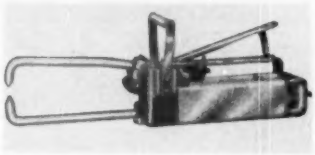
Special Flux for Dirty Cast Iron

CLAIMED specially useful for fluxing dirty cast iron, steel or malleable iron. White's "Dirtywork" welding and brazing flux is also said to be usable at high temperatures. The manufacturer says it works at the melting point of cast iron or steel.

Advantages claimed are 50% reduction in weld cleaning time.

L. B. White Co., 122 North 10th St., La Crosse, Wis.

for welding



Portable Spot Welder Handles ¼-in. Joints

HIGHER power and increased efficiency in the Model BW portable spot welder allow it to weld up to ¼-in. combined thickness of mild or stainless steel. With its automatic switch control, all that is needed is a slight squeeze to apply pressure to the tips; a second squeeze to turn on the current. Release of finger pressure cuts off the current and separate the tips.

The copper welding tongs come in three lengths: 6, 12 and 18 in., as well as in various shapes and sizes. For intermittent production on heavy-gage material, the company can furnish special water-cooled arms and tips.

For flawless and uniform welds, the new welder has a BW timer to insure equal current times. This timer, in combination with a specially designed steel stand, makes the welder a production machine. On the stand, welding pressure can be initiated by a foot pedal.

GREYHOUND A. C. ARC WELDER CORP., 606 Johnson Ave., Brooklyn 6, N. Y.

* * *

New Remote Control for A-C and D-C Welders

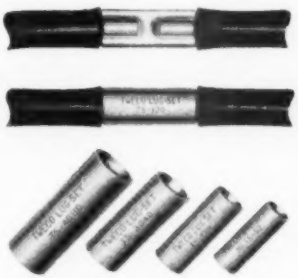
SHOWN in America for the first time at the First International Trade Fair at Chicago in August, a Norwegian-made remote control is adaptable to either a-c/d-c motor-driven welders or to a-c transformer welders. It is mounted on the electrode holder.

Current is varied by two buttons marked "high" and "low": these are connected to the welder through the same cable that carries the welding current. A motor drive and a relay box are connected to the crank on top of the welder.

To raise the current setting, the welder places his electrode holder next to the metal workpiece so that the "high" button touches metal. As long as the button is depressed, the motor drive will turn the crank on the welder to raise current output. To lower the current, the "low" button is touched to the work; current is lowered as long as the button is depressed. When welding begins, the remote control is cut out to maintain the set current level.

ETA A/S, MACHINE AND CONSULTANT DEPT., Prinsens Gate 2, Oslo, Norway.

* * *



Welding Cable Splicers Come in Four Sizes

TWECO has a new line of low-cost cable splicers to solve a longtime welding problem—how to splice a welding cable easily and safely. These are easy to install in shops or on field jobs with the Tweco "Lug-Set" block and punch recently put on the market (see THE WELDING ENGINEER, April, 1950, p. 43). They come in four sizes to handle cables from No. 6 through No. 4/0. Made of electrolytic seamless pure copper tubing, these splicers are protected after installation by split rubber tubes and covered with friction tapes.

Reel ends and short lengths of cable can be quickly made into usable lengths. The splice is said to withstand heavy pull. Since the splicers are of pure copper they provide ample current carrying capacity.

TWECO PRODUCTS CO., P. O. Box 666, Wichita, Kansas.

* * *

Cleaner Keeps Fog from Goggles, Shields

"FOG-FREE" prevents fog from forming on glasses and goggles when a man is working in steam or under humid conditions. This compound is a "surfactant-silicone composition" that is said to create an invisible coating on optical surfaces.

After cleaning the lens, preferably with the company's "K-Lens-M" lens cleaner, "Fog-Free" is applied by spray. Goggles or glasses are then polished by lens tissues. "Fog-Free" is claimed to have no harmful effects and it is said to keep glasses free of fog for many hours, depending on the severity of the conditions.

THE WILKINS CO., INC., Cortland 29, N. Y.

* * *

Flash-Welding Shields Have Spark Deflector

AN OVERHEAD brow guard or spark deflector goes with a new flash welding shield. Another type of headgear for the same shield has an open top for ventilation on hot jobs.

The rear section of the headguard is swiveled to permit up and down movement. Size adjustment is enclosed within a flat, smooth sleeve around the rear headband and comprises a series of holders and locking stud. Another band across the top of the weldor's head keeps the shield from slipping down.

A wide variety of windows—clear, green or wire screen—snap onto the headgear and are interchangeable.

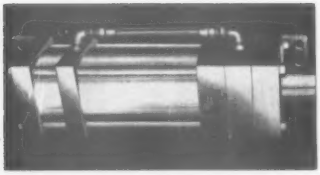
FENDALL CO., 4631 North Western Ave., Chicago 25.

* * *

Heat-Indicating Fluid in 1,650-1,950 F Range

TEMPIL CORP. announces that its "Tempilaq" fluid can now be used to show temperatures of 1,650, 1,700, 1,750, 1,800, 1,900 and 1,950 F. "Tempil Pellets," used for the same purpose, are supplied in 50-deg steps in the 2,000 to 2,500 F range.

TEMPIL CORP., 132 West 22nd St., New York City 11.



Fluid Pressure Boosters Lighten Welding Machine

NEW low-cost fluid pressure boosters that develop output pressures up to 10,000 psi are recommended for driving cylinders in welders, punches, presses, etc. Since one booster-driven hydraulic cylinder can do what might otherwise require an air cylinder 10 times as big, savings in weight and space are considerable. Too, the booster need not be mounted on the welder itself; an indefinite number of working cylinders can operate from one booster.

Input pressure for the boosters may be either air or hydraulic; output is always hydraulic. Operating speeds range from 30 to 450 strokes per minute. Models available include single-acting spring return boosters and the double acting "Air Miser" boosters that save up to 95% of the air used in single-acting circuits.

Miller Motor Co., 4027 North Kedzie Ave., Chicago 18.

* * *

Blow-Torch Made of Welded Aluminum

FIRST basic style change in blow torch construction in 75 years is claimed for a new aluminum-tank torch designed for handy chores around the house. Weighing only 2 lb, it is stated to be about 40% lighter than competitive models. Much simplified, it has only 3 parts and a Bakelite handle.

The tank is welded and has a safety filling vent. A lock on the stuffing box nut prevents the burner valve from backing out.

OTTO BERNZ CO., INC., Rochester, N. Y.

Line of Utility Torches for Heating, Brazing, etc.

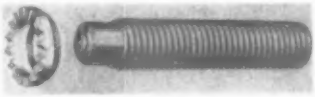
NEW line of utility torches that burn liquefied petroleum or other bottled gases includes tips for radiator soldering, heating lead pots, heating salamanders, etc.

Design of the torches involves an air inlet next to the handle. The air coming in the tip tube keeps it and the handle cool, which makes it possible to make the latter from solid bar metal. Tip tubes have standard pipe threads.

A special melting furnace, Type MF, for use with the utility torch is available. It is said to melt lead at 2 lb per minute. Other accessories are various size and style tips, extensions, hoses, regulators and couplings.

L. B. White Co., 422 North 10th St., La Crosse, Wis.

* * *



Arc-Welding Studs With Rolled Threads

ROLLED threads on the new and improved KSM arc welding studs are said to make the stud 20% stronger than standard studs. All studs come with arc shields and are fluxed by a process said to control the quantity of flux to plus or minus 1%.

KSM PRODUCTS, INC., 6512 Park Ave., Merchantville 3, N. J.

* * *

LEAD GLASS garments for X-ray technicians, doctors, dentists, inspectors, etc., protect arms, shoulders and lower legs. The cloth is said to be lighter than the heavy type lead-rubber aprons commonly used. Bar-Ray Products, Inc., 209 25th St., Brooklyn, N. Y.

Plastic Safety Goggle Has Removable Lens

YOU can remove the one-piece plastic lens in the "Saf-I-Duo" plastic safety goggle and interchange it with the lens in the "Saf-I-Spec" spectacle. That gives two types of eye protection with only one style of lens needed for replacement.

The new lens is made from optilite, a plastic meeting government specifications for light transmission and impact resistance. Frame is made of soft vinyl plastic, resistant to acids and alkalis. The "Saf-I-Duo" will fit over personal glasses, and four types of ventilation are available in the frame.

THE UNITED STATES SAFETY SERVICE CO., 1215 McGee St., Kansas City 6, Mo.

* * *

NEW PRODUCT BRIEFS

Dodge Slide-Set Vise, made by DODGE MFG. CORP., Mishawaka, Ind., embodies a patented fast slide action instead of by spinning the handle. The 58-lb vise opens or closes to any position in one second.

* * *

Small magnetic holder keeps test indicators, handy-lights, instruments, gages, etc., in place on metallic objects. It has a ball-and-socket joint and an adapter that fits most indicators. Enco Mfg. Co., 4522 Fullerton Ave., Chicago 39.

* * *

Tiny arbor press only 7¾ in. high exerts over 800 lbs pressure. It is useful to jewelers, instrument makers, schools, light manufacturers, etc. Accessory is a straightening attachment for truing up armature shafts, rods, etc. H. D. Herder, 2723 East Michigan Ave., Kalamazoo, Mich.

* * *

New demagnetizer takes out magnetic flux from tools, drills, punches, small arms and machined parts. It is also useful to equalize and stabilize magnetic flux in permanent-magnet assemblies in instruments and control devices. Essentially, it is an air-core coil built in a mountable frame. GENERAL ELECTRIC CO., Schenectady 5, N. Y.

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HARSTAIN 18-8-3 MO — for 316 and 317 stainless steels.

HARSTAIN 25-12 — for type 309 stainless-clad steels. Has high strength and resists oxidation at high temperatures.

HARSTAIN 25-20 — for use when annealing after welding is not practical; also for high-strength, ductile welds on high-carbon and alloy steels.

HARCHROME 5 CR — resists oxidation up to 1200 degrees F.

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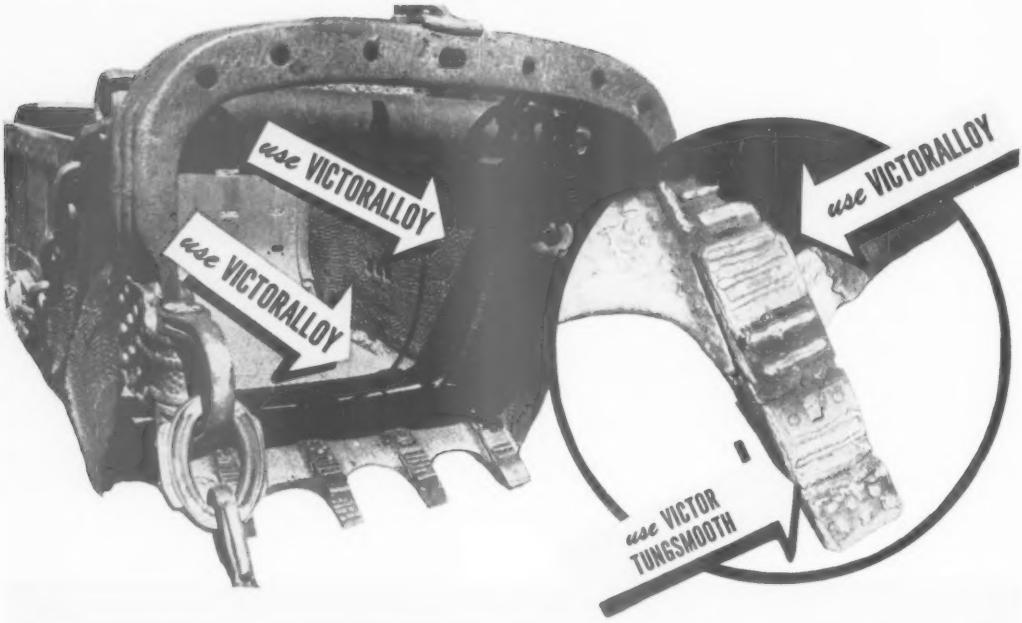
Designation	E-4510	E-6010	E-6011	E-6012	E-6013	E-6015	E-6016	E-6020	E-6030	E-7010	E-7016	E-7020
Weld positions	V, F, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	H-Fillet, F	Flat	V, F, OH, H	F, V, OH, H	H-Fillet, F
General Description	Wire—coating applied before drawing	Heavy coated D-C pos.	Heavy coated A-C or D-C	Heavy coated D-C neg. or A-C	Heavy coated A-C	Low-hydrogen D-C neg. or A-C	Low-hydrogen D-C pos. or A-C	H. coated A-C or neg. for fillets, A-C or pos. for flat	Heavy coated D-C pos. or A-C	Heavy coated D-C pos. only	Low-hydrogen D-C pos. or A-C	H. coated A-C or neg. for fillets, A-C or pos. for flat
MANUFACTURER												
Air Reduction[1]	41 or 63	78E or 78	230	87 or 387	90 or 90A		312	81 or 315		93		94
Alloy Rods[2]		6010	6011	6012	6013			6020		7010	7016	7020
American Agile		White	Blue	Red-White	Blue-Red	FMS		Blue-Grey				
Champion	Sulcoat	Blue Devil	Bluedac	Gray Devil Gray Devil 2 Gray Devil H.P.	Graydac			Black Devil	Red Devil	Blue Devil 85	Hy-Lo	Black Devil 75
General Electric	F	W-22	W-26	W-20F W-20 W-28 W-29	W-25		W-32	W-24 or W-27		W-52	W-32	W-54
Harnischfeger	Dustcote	AP or APV	AC-1	PF or PFA	SM or AC-3	70LA	70LA-2	DH-2		CM-50		CM-50-2
Hobart	Sulcoat	55 or 10	335	77 or 12	447 or 13	76PL	18	111		885		111-HT
Hollup	Hollup 305	Sureweld B or BP	Sureweld CB	Sureweld N, G or NM	Sureweld CN or UE			Sureweld FD	Sureweld A	Sureweld MLY-50	7016	Sureweld MLY-A
Lincoln	Stable-Arc	Fleetweld 5 or 5V Lightweld	Fleetweld 35	Fleetweld 7	Fleetweld 37 or 47 Planeweld 2		LH-70	Fleetweld 11		Shieldarc 85		Fleetweld 11HT
Marquette		No. 105	No. 120 or 140	No. 120	No. 151			No. 115				
McKay	21	15 or 15D	11	17 or 116	24	Puralloy 70		20	18	715		720
Metal and Thermit[3]	Sulcoat	Type R	Type A	Genex or Genex M	Type U or Alternex		Type HTS	Type FHP or Type D		Molex		Type DM
Page	R Rust Lime				Hi-Tensile G	Hi-Tensile M						
Reid-Avery[4]	D or Blue Label	7	11	8	13	Ferritic	16	20	5	74		64
Shobet Sales		32	33	34	35	LH-37		66				
A. O. Smith		SW 10	SW 14	SW 11 or 17	SW 15 or 16		SW61	SW 35	SW 20	SW 75		SW 76 or 78
Westinghouse	18 Sulcoat	AP	ACP	FD or FD-2	SW or SW-2	LoH		DH	DH	AP-MO		DH-MO
Wilson	17 or 18	98 or 98N	530	107 or 109	520 or 520A		512	1 5 or 106		Alloy Rod A		Alloy Rod B

*Trade name or Type No. is usually prefixed by company name.
V = vertical, F = flat, OH = overhead, H = horizontal, H-Fillet = horizontal fillet. [1]Airco prefix. [2]Weld-Arc. [3]Murex. [4]Raco prefix.

FASTER and SMOOTHER with
VICTOR HARD-FACING ALLOYS



	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTOR HS 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTOR HS 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Made for both acetylene and electric AC and DC application. Get your supply from your VICTOR dealer NOW.

VICTOR
WELDING AND CUTTING EQUIPMENT

Write today for helpful folder, showing where and how to use VICTOR hard-surfacing rods.

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

3821 Santa Fe Avenue, LOS ANGELES 11, CALIF.
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For Your Technical Library—

Free Catalogs • Booklets • Bulletins

A Welding Engineer Reader Service

1 GAS-WELDING CATALOG—Alexander Milburn, Inc., Baltimore 30. New catalog shows the entire line of Milburn cutting and welding apparatus, gas regulators, accessories and other supplies. It contains a cross-reference index of part numbers to enable holders of old Milburn or Black Mfg. Co. catalogs to order new or replacement parts.

2 HARD-FACING ALLOYS—American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill. Bulletin 650-W describes the Amsco line of hard-facing rods, electrodes and alloys. It recommends the proper alloy to use on basic parts of equipment in 15 industries.

3 INERT-ARC METAL-ARC—Air Reduction Sales Co., New York City 17. 26-page reprint, "The Aircomatic Welding Process," discusses the inert-gas-shielded metal arc process with a consumable electrode. Metal-arc transfer, porosity, applications to stainless steel and to clad materials are some of the subjects covered.

4 PORTABLE STUD WELDER—Graham Mfg. Corp., Ferndale 20, Mich. Single-sheet, two-color bulletin pictures the power supply and stud welding gun of the new Graham portable stud welder. Power sources, air pressure needed, applications and other details are discussed. See page 44.

5 WELDING CABLE SPLICERS—Tweco Products Co., Wichita 1, Kans. Single-sheet bulletin SL-51 describes new copper splicers for welding cable. Application directions and illustrations show how they work. Bulletin also shows solder-type lugs for cable. See page 45.

6 HYDRAULIC CYLINDERS—Miller Motor Co., Chicago 18. 8-page, two-color Bulletin H-104 discusses Miller high-pressure (2,000 psi) hydraulic cylinders for pushing, pulling, lifting and clamping applications. Cutaway diagrams detail the parts, and tables give all pertinent specifications.

7 TUNGSTEN, MOLYBDENUM—Fansteel Metallurgical Corp., North Chicago, Ill. 24-page booklet gives metallurgy, physical, mechanical and chemical properties of tungsten and molybdenum. It also lists uses, fabricating techniques and available forms of these two metals.

8 FLASH WELDING SHIELD—Fendall Co., Chicago 25. Single sheet bulletin shows the improved Fendall face shields for flash welding, buffing, light grinding, spot welding, etc. Two types of headgear are illustrated and sizes and window types tabulated. See page 45.

9 COLD WELDING—Koldweld Corp., New York City 16. 4-page bulletin tells new developments in "cold" welding. It illustrates "Trap welds" for kitchen utensils, "stagger welds" for shelving and tank sections and joints for wires and conductors. All joints are explained and possible applications outlined.

THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Two post cards are printed here, each containing space for four items.

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10 PORTABLE SPOT WELDER—Mid-States Welder Mfg. Co., Chicago 36. Single-sheet bulletin tells about the new "Zip" portable spot welder made by Mid-States. It describes its construction, capacity and suggests applications.

11 HARD-FACING CATALOG—Air Reduction Sales Co., New York City 17. 20-page catalog on Airco hard-facing alloys covers typical uses, mechanical properties, chemical analyses, outline of procedures, etc. It also recommends grinding wheels for dressing various hard-facing deposits.

12 FOG PREVENTIVE—The Wilkins Co., Inc., Cortland, N. Y. Pamphlet describes properties of "Fog-Free," a new chemical compound that is said to prevent fog from forming on goggles, spectacles, etc., for many hours. See page 45.

13 SEMI-AUTOMATIC WELDING—The Lincoln Electric Co., Cleveland 1. 6-page, two-color folder describes the "high-density" current principle employed on the newest "Manual Lincolnweld" equipment. It discusses the equipment and tabulates settings for controls for varying plate thicknesses and number of passes.

14 CUTTING TIPS—Victor Equipment Co., San Francisco 7. 4-page folder No. 314 illustrates and gives specifications for the Victor line of cutting tips. Listed are tips for cutting steel plate, cast iron, scrapping, riveting operations, multi-flame tips and underwater and oxyhydrogen tips.

15 HYDRAULIC BOOSTERS—Miller Motor Co., Chicago 18. Low-cost fluid-pressure boosters can save weight and costs in welding, punching, shearing and pressing operations. 12-page, two-color Bulletin B-200 tells how. Data on sizes, models, types, installation and operation are tabulated. See page 46.

16 REMOTE CONTROL—ETA A/S, Machine and Consultant Dept., Oslo, Norway. 4-page folder explains operation and construction of a new remote control for arc welders that utilizes only the single cable to the electrode holder. See page 45.

17 ALKALI ON NICKEL—The International Nickel Co., New York City 5. 24-page technical bulletin T-6 provides charts and data on the resistance of nickel and nickel alloys to corrosion by caustic alkalis.

18 FLEXIBLE METAL HOSE—Atlantic Metal Hose Co., Inc., New York City 23. Catalog 500 supplies application and construction data on metal hose for ventilating and exhausting, also for high-pressure hose, diesel exhaust hose, etc. Navy tables for bronze and steel hose give bending diameters, bursting pressures, etc.

19 ARC-WELDING STUDS — KSM Products, Inc., Merchantville, N. J. 4-page, two-color folder on KSM studs describes stud material, threads, fillet diameter, fluxing and arc shields. Various shapes of studs are illustrated on reverse side.

20 SALT BATH FURNACE—Ajax Electric Co., Inc., Philadelphia 23. 4-page, two-color Bulletin 123 describes construction and operations of a new Ajax salt bath furnace for heat treating and hardening.

21 FIRE EXTINGUISHING—Ansul Chemical Co., Marinette, Wis. 4-page folder, "The Fundamentals of Fire Extinguishment" tells in text and picture the absolute essentials needed to put out fires in flammable liquids, in ordinary materials and in electrical equipment.

22 HYDRAULIC CYLINDERS—Hanna Engineering Works, Chicago 22. 28-page Catalog 233A describes and pictures many types of hydraulic cylinders for pressures up to 1,500 psi. Dimensions, velocities and pressures are tabulated.

23 STUD WELDING—Nelson Stud Welding Div., Lorain, O. 4-page folder on the Nelson customer service organization indicates the location of national distributors of stud welding equipment.

24 POLYPHASE MOTORS—A. O. Smith Corp., Motor Div., Los Angles 22. 12-page bulletin EM4-812 describes horizontal polyphase electric motors of 1 to 75 hp. Insulation, bearings, ventilation, mounting, etc. are discussed.

25 STAINLESS-STEEL WALLS—Allegheny Ludlum Steel Corp., Pittsburgh 22. 24-page booklet tells about methods of constructing stainless-steel curtain walls. Drawings show existing and planned types of details such as facings, insulation, joints, vents, etc.

26 AIR-OPERATED CLAMPS—Lapeer Mfg. Co., Lapeer, Mich. 4-page folder tells about two new 200 and 1,200 psi air-operated clamps suitable for welding fixtures. Measurements and air requirements are listed. See page 44.

27 CUT-OFF WHEELS — Chicago Wheel & Mfg. Co., Chicago 7. 6-page pocket-size folder tells about cut-off wheels for bar stock, extruded forms. Moisture-proof protection for the wheels is explained.

28 WELD TIMERS—Robotron Corp., Detroit, Mich. Single-sheet Bulletin 35 tells about non-synchronous sequence weld timers and explains their simplicity of maintenance, construction and accuracy. Operations are thoroughly outlined.

29 ARC-WELDER—Mid-States Welder Mfg. Co., Chicago 36. Single-sheet bulletin illustrates the company's a-c welders and high-frequency units for inert-arc and carbon-arc welding. It also pictures the simplified current control.

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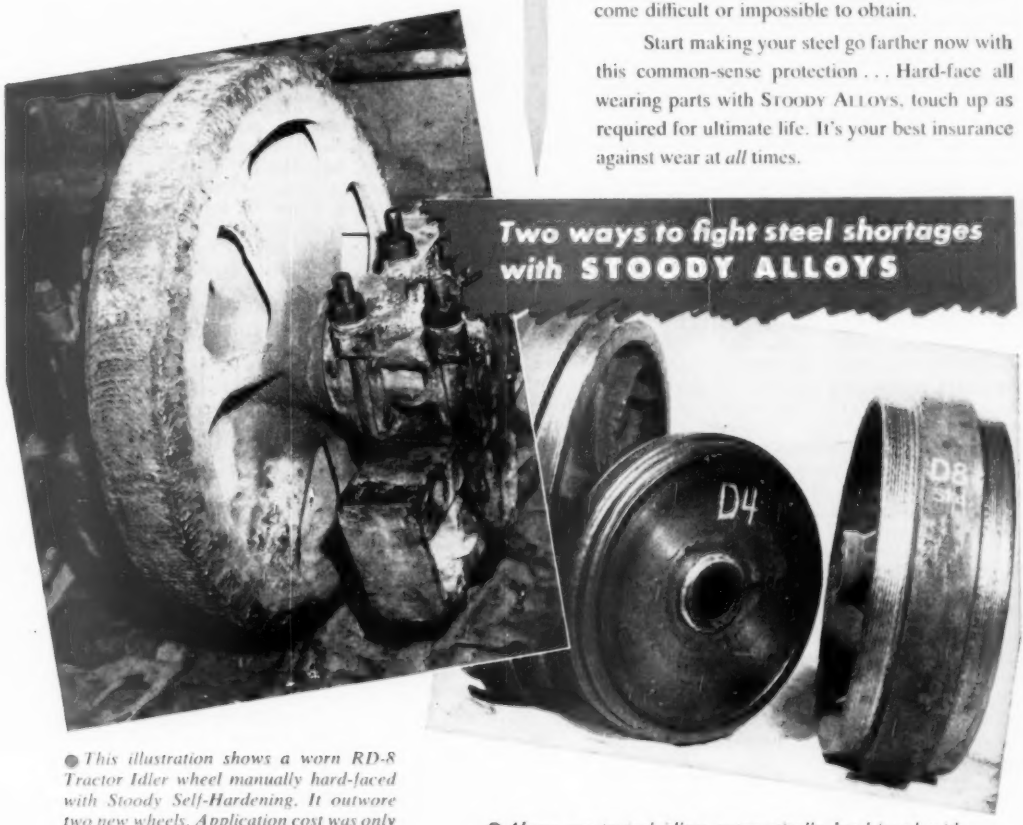
Common-Sense Equipment Protection during STEEL SHORTAGES

WITH SHORTAGES again threatening, Stoody Hard-Facing returns to war-time importance . . . the job of keeping equipment on the go, of combating all replacement scarcities by making the old parts do.

Surprisingly, Stoody Hard-Facing not only reclaims worn equipment, *but actually restores it to better-than-new condition* at less than new-part cost. Since only the areas of concentrated wear need protection, the job is simple and economical.

A part whose life is doubled—or tripled—not only conserves dollars but protects your precious inventory of spare parts when replacements become difficult or impossible to obtain.

Start making your steel go farther now with this common-sense protection . . . Hard-face all wearing parts with STOODY ALLOYS, touch up as required for ultimate life. It's your best insurance against wear at *all* times.

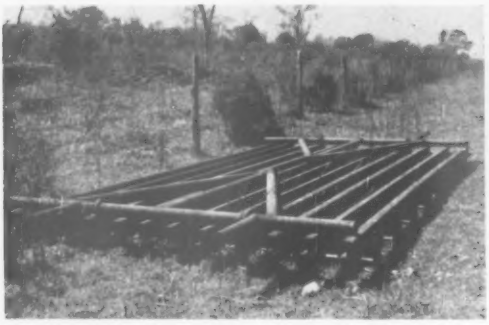


● *This illustration shows a worn RD-8 Tractor Idler wheel manually hard-faced with Stoody Self-Hardening. It outwore two new wheels. Application cost was only a fraction of replacement cost.*

● *Above are typical idlers automatically hard-faced with Stoody 105. Automatic welding insures greater smoothness and uniformity of deposit besides lowering cost.*

STOODY COMPANY 11941 EAST SLAUSON AVENUE, WHITTIER, CALIFORNIA

on the job



CATTLE ARE KEPT home on the range by means of this weldor-made guard. It carries heaviest trucks, does away with the need for gates

UP GOES PART of the conveyor line when the operator gun welds the bottom pan to refrigerator cabinet. The tilting is controlled by foot

Packaged Cattleguard

By Elton Sterrett

IT WAS necessary to install cattleguards on a road construction job where lateral roads from various ranches ran into the main highway. What was wanted was something that would permit rapid passage of cars and trucks, yet keep the cattle from straying.

Utilizing old rails, the weldor built up, in his shop, a "packaged" unit that could be trucked to the site and skidded into place on concrete footings.

Picture at top left gives details of construction. The transverse rails were spaced 8 in. on centers, the other on 30-in. spacing. The welds were at points of contact between the flange of one rail and head of the one below. The completed structure is able to carry heaviest truck loads without distortion.

The end sections of the guard were made up from 2½-in. pipe. An inverted "V" rose to the center, while an extended base was held to two of the rails through straps or saddles that left the end free to revolve. Two spuds, set to swing between projecting rails, engaged the lower part of the base to hold the end piece. The fence wires were carried through holes in the vertical member set within the inverted V.

The end sections were wired to the rails for trucking, as shown in the picture.

* * *

Tilting Assembly Line

(See right picture)

ONE DOESN'T expect a section of the conveyor assembly line to tilt upwards, but that's just what happens at the Westinghouse appliance division plant at Mansfield, O. The tilting is done purposely to help out the operator of a gun spot weldor, whose job it is to weld the bottom pan of a refrigerator cabinet. By swinging up the conveyor section, he can make his welds without stooping or lifting the cabinet. The tilting is done by an air cylinder, controlled by a foot valve.

* * *

Better Open-Hearth Doors

By Robert C. Singleton

IN ONE OPEN-HEARTH mill in the Chicago area, the combination of plastic chrome ore and end-welded studs has resulted in cost savings of better than $35,000 a year. The eleven furnaces involved are able to increase their production by more than 2,500 tons during the same period.

The usual front door to an open-hearth furnace consists of a steel frame, the insulated surface that's exposed to the flaming interior and a water jacket to cool the insulating material. Instead of the conventional refractory brick, the new-type door has a thick layer of stud-supported ram mix. This is a neutral refractory material that is made of iron and chrome ores with a binder of water glass or sodium silicate. The entire surface is water-cooled, and the studs that support the ram material are welded directly to the back plate of the door. The solid-back or tank-type door is the most commonly used. A variation is the panel door, which includes a series of peepholes for determining the condition of the insulating material from outside.

Though the new doors may cost more than the conventional brick, the increased initial cost is more than countered by the greater number of heats that they are able to withstand. On a cost-per-door-per-heat basis, many operators have found the studded and rammed doors to be less expensive.

The end-welded studs used in an open-hearth door serve two important purposes. One is to provide proper support for the chrome ore ram material. The other function is to provide a heat transmission path from the hot surface to the cooling tank behind the door.

Selection of the proper stud size and location depends somewhat upon local conditions and individual preferences. A few basic principles apply. Generally speaking, ½-in. studs are placed on 2½ or 3 in. centers, ⅝-in. studs on 3-in. centers, ¾-in. studs on 3 or 4 in. centers. The studs should be located on the door in such a manner as to assure straight lines. When studs are welded to a door for the first time, chalk lines or a simple wood template can be used. When studs are welded on 3 or 4 in. centers, it is advisable to weld additional studs in the center section of the door immediately above the wicket since this is the area of greatest deterioration. As many as 300 studs have been welded on a single door.

When a door is removed from an open-hearth furnace for relining, all of the studs should be cut out by a scarfing or rivet-cutting torch. Complete removal of all of the old studs is particularly important to the proper operation of the door. One reason is that the new studs should be end welded to the back plate in the same position as the old ones. This prevents a build-up of old ram material, makes packing easy and lengthens the life of the

Nelson Stud-Welding Photo

STUDS WELDED to the back plate of open-hearth door hold the chrome ore rammed into the door. When doors are relined, studs are removed by a scarfing or rivet-cutting torch

door. Unless the nubs of studs are removed each time a door is relined, the surface of the door will soon become covered with a layer of nubbins, chrome ore and slag, forming a barrier that reduces the cooling effect of the water.

Even though the studded door will only last for 100 heats, the total door changes required during a year (in one steel plant) would be only 38 as compared to the 255 required for brick doors. In this case, the total mill cost of the door preparation will be about $7,000 greater for studded doors, but door handling costs will be $26,000 less. The net saving, therefore, is some $19,000. The tonnage lost when brick doors are used amounts to 2,805 as against 418 tons of steel lost when studded and rammed doors are used.

* * *

Flame-Hardening Tamping Bars

BALLAST tamping bars produced in one shop are given an economical flame-hardening treatment to make them last longer. The bars are of 0.35% carbon steel. Hardness at points of wear is increased from 300 to 500 Brinell by flame-heating and quenching bars in a water tank.

According to The Linde Air Products Co., the bars are placed in the tank with their blades out. Oxy-acetylene heating heads — one on each side — travel along the immersed bars to heat the blades. Two different types of heating heads are used to get the hardness pattern desired. A water quench follows the flames.

The heating heads are mounted on a portable cutting machine. It moves along a track at a speed of 4 ipm, taking about 40 seconds to heat a 3-in. blade.

Welder attaching flange to tubular steel part of business machine stand (above) using Naval Brass welding rod. Courtesy Underwood Corporation, Bridgeport, Conn.

BRAZE WELDING USED IN FABRICATION OF TUBULAR STEEL STANDS

Braze welding of the flanges and other light-gauge parts to tubular steel in the production of tables and stands for business machines insures a strong bond and a minimum distortion of the parts.

The illustrated business machine stand is a good example of braze welding doing a superior job.

Braze welding requires temperatures well below the melting point of the steel and does not require long preheating or after-cooling. At the same time, the steel is not excessively oxidized, which not only would weaken the stand but require greater finishing time.

The removal of heavy deposits of the brazing alloy can be done speedily and cleanly with either a wheel or a file.

The Naval Brass rod used for this job tins rapidly when a good flux is used and a non-porous braze is produced with the use of a gas torch.

When a good braze is produced, the joint is often stronger than the metal being joined.

Write to Bridgeport for booklet, "Bronze Welding Alloys."

"Bridgeport" BRASS

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF **BRIDGEPORT BRASS**

AIRCRAFT welding classes have been started by Solar Aircraft Co., San Diego. Here, Mrs. Joline Smith and Mrs. Odeta Holt are checked by Alvin L. Bennett, a Solar welding technician

NEWS

Solar Trains Its Own Aircraft Weldors

A SHORTAGE of qualified aircraft weldors in the San Diego area has prompted Solar Aircraft Company to re-establish welding classes for both men and women employees. New orders for military aircraft have expanded Solar's business considerably. Afterburners for jet engines, certain airframe parts and exhaust manifolds for piston engines are major products of the company. Production departments recently commenced a 48-hour week.

To handle the various light metals and stainless steels used in Solar products, trainees must learn oxy-acetylene, arc and inert-gas shielded arc welding. Classes are on a 8-hour day schedule and consist of 12 students. When the above picture was made, six of the weldors were women.

* * *

More Helium-Arc Welding Causes Plant Re-opening

INCREASED civilian demand for helium, due in large part to helium shielded arc welding, has necessitated reopening of the government's helium plant at Amarillo, Texas. Plant is operated by the Bureau of Mines.

Principal source of helium since 1945 when the Amarillo plant was closed has been the plant at Excell, Tex., which has a rated annual capacity of 60 million cu ft. To this figure, the Amarillo plant will add 36 million cu ft per year.

The outbreak of fighting in Korea has caused part of the heavier demand for helium, the Bureau of Mines reported, but the civilian consumption has been climbing steadily for several years. During the fiscal year of 1950, consumption reached 63,311,000 cu ft. Estimates for the 1950-51 fiscal year indicated about 80 million cu ft will be needed.

* * *

18 British Experts Look at Our Welding

HUNTING for ways to increase British welding production, 18 specialists in United Kingdom trade associations and allied fields arrived in New York City in September to inspect American welding processes.

The team is led by Dr. H. G. Taylor, director of research, British Welding Research Association, and sponsored by the Anglo-American Council on Productivity. Its members come from the British steel construction, chemical process, locomotive, shipbuilding, acetylene, electrical and metal fabricating industries.

The visiting Britishers were scheduled to spend six weeks in observing plants in New York, Philadelphia, Milwaukee, Detroit, Pittsburgh and Washington. They were also to attend the 32nd Metal Show at Chicago, Oct. 23 to 27. The American Welding Society helped arrange the itinerary.

May Pipe Oxygen to Houston Industries

AN underground network of oxygen lines will supply factories in the Highland Industrial Terminal Area at Houston, Texas, if plans go right for Houston Oxygen Co. Permits for the system have been requested from the city of Houston. If such permission is granted, the oxygen network would be the first in the Southwest.

Such a pipe line would cut down one of the biggest costs in the supply of industrial oxygen to welding fabricators and other users—its delivery. To minimize safety hazards, plans call for the oxygen to be metered to customers at low line pressures (200 psi). Customers may boost pressure to individual requirements as they receive the gas.

The Houston Oxygen Co. is moving into part of a new 100,000 sq ft building being erected for Big Three Welding and Equipment Co.

* * *

You Should Guard Ears As Well as Eyes

LOUD noises in factories mean deafness, fatigue, nervous tension and serious accidents to workers. To their management, noise means absenteeism, wasteful labor turnover, loss of efficiency and loss of production and an increase in the number of compensation claims.

Efficiency has shown a marked upturn where attention has been paid to noise abatement. According to Flents Products Co., Inc., manufacturers of ear safety equipment, reports show an increase of 3% in production at a textile mill.

Further evidence of the noise problem is shown by recent amendments to workmen's compensation acts of several states to allow payment for impairment of hearing caused by industrial noise.

In New York state in 1948, the number of deafness compensation cases closed in 1948 totaled 202 and the amount of compensation awarded was $272,072.

Those industries presenting the most acute noise problems are: textiles, shipbuilding, structural steel, machine shops, metal fabricating.

In a recent report to industry, the committee on conservation of hearing of The American Academy of Ophthalmology and Otolaryngology recommends that the use of ear protectors be made compulsory for workers exposed to noise levels of an injurious nature. In their words it is "as necessary for the protection of hearing as is the use of safety goggles for the protection of vision."

Longer Life

with COLMONOY hard facing

Reports from every industry show longer equipment life after hard facing with Colmonoy.

Colmonoy hard facing shows the way to longer life for your equipment and machine parts. No matter what is the cause of wear, Colmonoy has the answer to restore worn parts and protect your new parts. You'll find protection against abrasion, corrosion, and impact in its complete line of hard facing alloys. Depending on your needs and facilities, Colmonoy is available in the form of rods, electrodes, paste, powder, metallizing wire, and castings. Colmonoy offers other advantages:

Easy to apply. Any weldor, without special training, can pick up Colmonoy and do a good job. No danger of expensive rejects. Colmonoy reduces welding time on every job.

Lower welding temperatures. Lower temperatures means less chance of part distortion. You save on gas or welding current, too.

The Sprayweld Process. Powdered Colmonoy can be sprayed and then welded to the part. Spraywelding uses less material and is faster than hand-welding. A Sprayweld surface is smooth and can be held to within .010". No patching or rejects. Write for more information.

Complete engineering data for applying Colmonoy on typical jobs in any industry available on request.

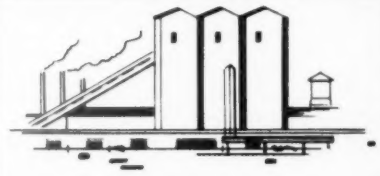
AGRICULTURE

Plow shares treated with **Colmonoy** sweat-on paste hold their edges and last up to 17 times longer.

CHEMICAL and OIL REFINING

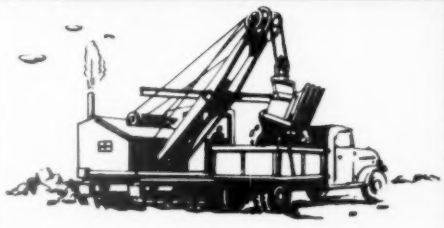
Pump parts **spraywelded with Colmonoy No. 6** give 600% more service even when operating in Caustic or Sulphuric.

Valves, operating in even the most corrosive mineral acids, last 5 times longer when protected with **Colmonoy No. 5 rod.**



CEMENT

Mill hammers faced with **Colmonoy No. 1** crush 300% more rock.



CONSTRUCTION

Shovel teeth built up with **Colmonoy No. 1** reduces maintenance cost over 70%

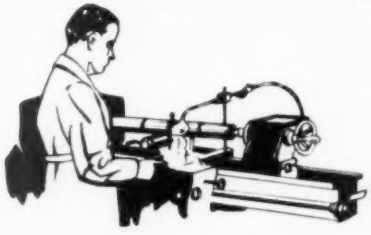
ORDER FROM YOUR LOCAL JOBBER

WALL COLMONOY

CORPORATION

HARD FACING ALLOYS

19345 JOHN R STREET DETROIT 3, MICHIGAN

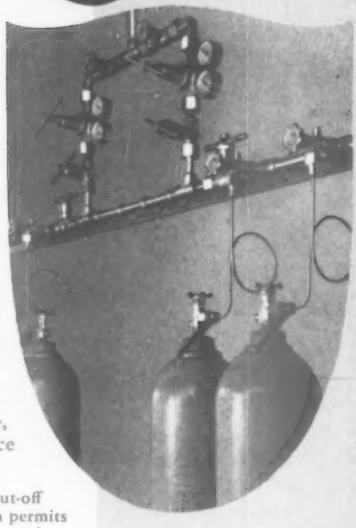


METALWORKING

Colmonoy center tip castings soldered on new or worn centers wear from 7 to 10 times longer.

REGO

MANIFOLDS



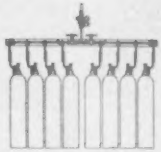
Rugged construction and precision control equipment give RegO manifolds long life, safe, dependable performance and low maintenance.

Continuous Operation . . . Shut-off valve at each cylinder station permits removal of any cylinder without shutting down entire side of manifold. Master valves control each bank of cylinders.

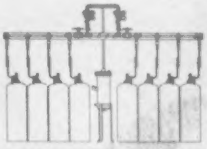
Unit Construction . . . Header consists of steel I-beam, extra heavy brass pipe and fittings, cylinder stations and master shut-off valves . . . *with all permanent connections silver brazed.*

Precision Regulation . . . Uniform delivery pressure is assured by dual large capacity two-stage RegOlators.

Listed by Underwriters' Laboratories, Inc. and Factory Mutual.



Typical Single Regulator Wall-Type Oxygen Manifold



Typical Dual Regulator Floor-Type Acetylene Manifold

for
OXYGEN
ACETYLENE
HYDROGEN
NITROGEN
and other high pressure gases

*Reg. U.S. Pat. Office

Write for 24-page catalog giving complete specifications.

REGO

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

The BASTIAN-BLESSING Company
4201 West Peterson Ave. Chicago 30, Illinois

Farm Welding Awards Announced by Lincoln

FARMERS in 43 out of the 48 states collected the $20,000 in awards for descriptions of arc welding on the farm offered by the Agricultural Award Program of the Lincoln Arc Welding Foundation. The number of awards was 141 ranging in amount from $50 to $1,755.

In honor of the top ten award winners in each division of the program, scholarship funds totaling $5,000 have been given by the foundation to the colleges of agriculture in the states they live in. The money will be used by the colleges to grant scholarships in the names of the award winners.

Division I of the program was open to agricultural producers proper. Division II was open to agricultural education and services, such as county agents, teachers and other agricultural leaders.

The $1,500 first award in Division I went to Armin and Kenneth Garver of Youngstown and Poland, O., who with their father farm 300 acres of land, raising grain, poultry, berries and popcorn.

Second award in this division went to Elgar Schroeder of Morrisonville, Wis.

The $1,755 first award in Division I went to Professors Albert Mowery and David McClay of the Pennsylvania State College. Kenneth Imig, farm adviser for Iroquois County, Illinois, took the second award for $1,170. The prizes for Division II were larger than those for Division I because the jury of award vacated several awards in Division II and the full $10,000 was apportioned among the remainder.

The jury of award, headed by Dr. E. E. Dreese of The Ohio State University, consisted of: E. W. Schroeder, Oklahoma A & M College; V. J. Morford, Iowa State College; J. W. Martin, University of Idaho; A. H. Hollenberg, U. S. Office of Education; Kyle Engler, University of Arkansas; H. H. DeLong, South Dakota State College; Carl Albrecht, Michigan State University; O. C. French, Cornell University and F. C. Fenton, Kansas State College.

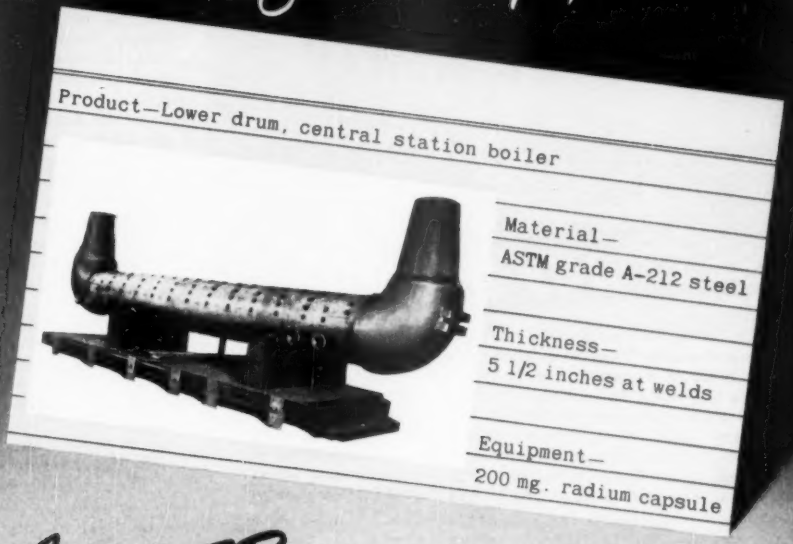
This program is the second which the Lincoln Foundation has sponsored to stimulate welding on farms.

* * *

RWMA Moves Offices

THE offices of the Resistance Welder Manufacturers Association have moved from 505 Arch St., Philadelphia, to new quarters at 1900 Arch St., Philadelphia, that have been extensively remodeled.

What's the right X-Ray film?



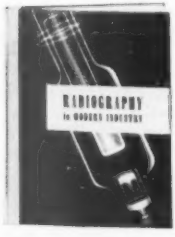
ANSWER:

KODAK INDUSTRIAL X-RAY FILM, TYPE K

● Here was thickness—thickness that demanded the fastest possible film to keep exposure time down. Gamma radiation was to be used.

So the film for the job was Kodak Industrial X-ray Film, Type K, with lead-foil screens.

This is the film that gives you the shortest exposure time for radiography by radium. You use it when checking for significant weld irregularities in thick sections.

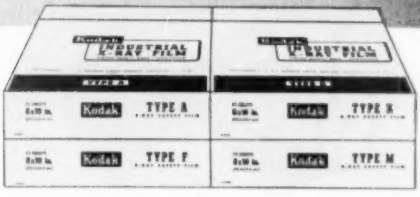


RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price $3.

Radiography

...another important function of photography



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. These furnish the means to check welds efficiently and thus extend the use of welding processes.

Type K has medium contrast with high speed. For gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without calcium tungstate screens.

Type M provides maximum radiographic sensitivity, high contrast, and exceptional detail under direct exposure or with lead-foil screens. It has extra fine grain and the speed is adequate for examination of light alloys at average kilovoltage and for much million-volt radiography of steel and heavy alloys.

Type A offers high contrast with about three times the speed of Type M, but with slightly more graininess. Used direct or with lead-foil screens for study of light alloys at low voltages, and of heavy steel parts at 1000 kv.

Type F provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead-foil screens.

EASTMAN KODAK COMPANY
X-ray Division • Rochester 4, N. Y.

Kodak
TRADE-MARK

made to SAVE MINUTES
made to SAVE MONEY

on every welding and cutting job!

for the best results at the lowest cost

BEST BUY BURDOX

Equipping the men in your welding-cutting departments with the correct tools and accessories is the quickest way for you to save time and cut costs. BURDOX products are made by men with years of practical experience in welding and cutting — that's why they reduce lost time to a minimum and produce better results. Get the best in welding, cutting and safety equipment without paying premium prices by using BURDOX all the time. The products illustrated below are only a few of the hundreds in the BURDOX line that offer you outstanding value. Make your own comparison by writing for Free BURDOX Catalog today!

CYLINDER TRUCKS DELUXE MODEL— The greatest cylinder truck value you've ever seen! Streamlined one-piece safety handle. Streamlined tool tray and rack. Bicycle type wheels with solid rubber tires. All welded construction. Chain holds cylinders securely.

GAUGES— Standard 2½" all brass beaded gauge with polished finished case. These pressure gauges are the result of broad experience in the oxy-acetylene welding and cutting process. They are carefully designed and manufactured . . . are unusually rugged and accurate.

CYLINDER CONNECTIONS— All brass, made to close tolerances. Guaranteed against mechanical defects. Finest made, yet cost no more.

EYEGARD GOGGLES— The best goggle value on the market! Super-light, impact resisting plastic and exclusive 10-way ventilation. Cool and sweat-free . . . always!

TRIP-L-ITE FLINT LIGHTERS— Lasts three times as long as ordinary lighters. Produces a hot, fat spark every time. Works easy, insures instantaneous lighting.

EXTRA-FLEX CABLE— Extra-flexible, extra-resistance to abrasion, oil and water because of special construction. Millions of feet sold because of performance and price.

THE BURDOX LINE INCLUDES:

WELDING AND CUTTING EQUIPMENT AND MACHINES • SOLDERING AND BRAZING OUTFITS • INDUSTRIAL GASES • REGULATORS AND GAUGES • HOSE AND CABLE • ACETYLENE GENERATORS • GOGGLES AND HELMETS • LENSES AND FACE SHIELDS • ROD AND FLUXES • CYLINDER TRUCKS

THE BURDETT OXYGEN COMPANY

3302 LAKESIDE AVENUE GENERAL ELECTRIC CLEVELAND 14, OHIO
Arc-welding Distributor

AKRON • MANSFIELD • CINCINNATI

What's the Future for Welding Distributors?

FEATURED speaker at the eastern zone meeting of the National Welding Supply Association in New York City, on Sept. 26, was K. Wm. Ostrom, former chief of the welding division of the War Production Board in World War II. Talking on the welding distributor's place in the allocation program now being contemplated by the government, he predicted that the distributor would be needed as always.

Attendance was 84 with some men coming from as far west as Salt Lake City and as far south as Charleston, West Virginia.

Other addresses included a talk on the value of belonging to a trade association by Glenn G. Garman, president of NWSA. A. C. Axtell, president, Essex Welding Equipment Co., Inc., Newark, N.J., talked on methods to control inventory.

Customer relations were discussed by Thomas G. Butler, president, Butler Cylinder Gas Co., Reading, Pa. John A. Howe, president of Garden State Welding Supply Co., Jersey City, N.J., discussed the distributor's needs in his supplier's catalogs, price sheets, sales manuals, advertising and direct mail pieces.

A two-part discussion on the renting of welding equipment and the provisions to be included in rental agreements was led by Charles P. Weber, Weber-Semmer Co., Pittsburgh. E. R. Joseph, E. R. Joseph, Norristown, Pa., talked on why his firm helps in the annual overhead expense reports and why he feels they are of value.

Five new members were welcomed into the association. They are: American Welding Supply Co., Brooklyn, N. Y.; Adelson-Werts, Inc., Hartford, Conn.; National Welding Supply Co., Buffalo, N. Y.; Zane Welderaft Supplies, Hartford, Conn., and K. William Ostrum & Co., Philadelphia, Pa.

* * *

Gaston Tools Changes Ownership and Name

GASTON Power Tools, Harvey, Ill., a manufacturer of heavy-duty grinders and polishers, was recently sold by Ralph M. Gaston to new interests. The company, now known as Gaston Power Tools, Inc., will continue operations at 14829 Loomis St., Harvey. Arthur O. Backen is president.

According to Mr. Backen, sales and service facilities of the firm have been enlarged and improved. Wider distribution of Gaston products is being established.

AO Gloves

THRIFTY 2 WAYS:

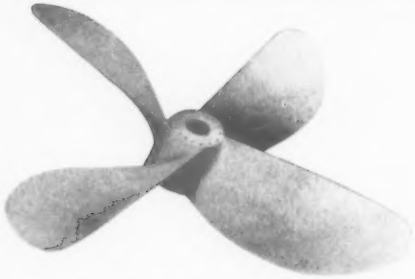
. . . in Cost . . . in Wear!

AO TX200 GLOVE

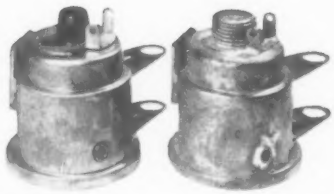
You'd expect to pay more for a chrome-tanned cowhide glove of this high quality — a glove that's lightweight for working comfort, yet with rugged wearing ability that makes your glove dollar go farther. The TX200 is standard length, gunn style and has a welted seam at the base of the palm and wrist. Welders like the one-piece back and wing thumb because they provide a fuller palm and help keep hands from tiring. Order the TX200 — one of the newest in AO's extensive line — from your nearest AO Safety Products Representative.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities



Salvage with Phos-Trode Saves Thousands — A defective keyway in this giant marine propeller might have sent it to the scrap heap. Expensive replacement was avoided by chipping out the keyway, building it up flush to the inside bore with weld metal, and machining a new keyway. Ampco Phos-Trode electrodes were selected for their dense, easily machined deposit — and for their easy manipulation in all positions.



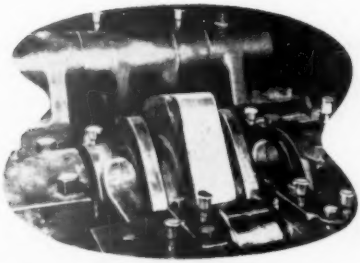
Resistance Welding Saves $14,000 per Year Over Silver Soldering — A ⅝" diameter oil drain plug was formerly soldered in place in this deep drawn steel casing. A slight design change adapted this operation to projection welding. Annual savings: $14,000. Ampco-Weld products — the complete line of standard and special electrodes, holders and alloys, specifically engineered to give longer life, less downtime, and clean welding — can help you cut your costs, too.

Tough Welding

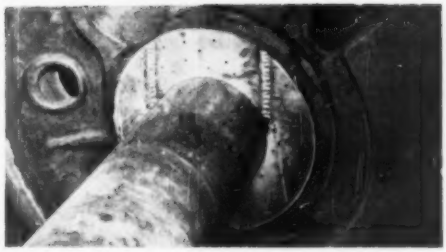
Rebuilt at Low Cost, Better Than New — Ampco-Trode 160, 200, and 250 overlays save money in countless ways. This giant steel tube-mill gear "Bronze-Faced" with Ampco-Trode 250 is a case in point.

Ampco-Trode Overlays Triple Valve Life — Severe abrasive and erosive action in a carbureted water gas installation limited valve life to 4 months. They were rebuilt — with machineable Ampco-Trode 10, at ½ the cost of replacement.

Cold-Bent, Resistance-Welding Tips — for longer runs, lower costs, faster delivery, larger savings. Made without patterns or dies. Cold bending retains full, high physicals. Holes bend with metal, no special drilling required for water passages; gives you cooling right to the welding face.



Service Life Increased 1200% — Actuating cam on this cold nut blanker, when "Bronze-Faced" with Ampco-Trode 200 to resist wear, outlasts other hard-surfacing materials by as much as 1200%.



Phos-Trode Saves Time and Money in R. R. Maintenance — Phosphor bronze liners add many miles to locomotive operation. They reduce friction and wear between the driving box and wheel hubs. Installation has been simplified by welding in place with Phos-Trode, an electrode noted for its easy handling. A section is cut from the liner so it may be slipped over the axle. Each section is beveled to 45° and welded vertically with Phos-Trode to provide a dense deposit which feather-edges for a strong, reliable bond.

AMPCO®

is Easier, Faster and Cheaper

—when you use Ampco Bronze Electrodes for fabrication, overlays or maintenance and repair

- ✓ ***For welding dissimilar metals*** — steel to clean cast iron; steel or cast iron to bronze, brass or copper; and/or any of these to nickel alloys.
- ✓ ***For Corrosion-resistance*** — — extremely useful when fabricating process-industry equipment.
- ✓ ***For long-wearing overlays*** — where hardness and resistance to wear are essential requirements.
- ✓ ***For ideal bearing qualities*** — mates against hardened steel without seizing or galling.

On almost any complicated welding job you can use Ampco Bronze Electrodes to good advantage. Check the four features above — also look over the varied applications shown here. They give you a fair idea of how these versatile Ampco electrodes can save you welding time and cut costs.

Try them in your own plant. You'll find many more ways to profit from these all-purpose rods. See your nearest Ampco distributor. Send coupon for complete bulletins of money-saving Ampco electrodes (both arc and resistance-welding types) — and helpful information on welding techniques.

Ampco aluminum bronze and other Ampco copper-base alloys are available in a variety of grades to meet your exact requirements in any form you need: rolled sheet or plates, sand or centrifugal castings, forgings or extrusions, resistance-welding electrodes, corrosion-resistant centrifugal pumps and plug-valves.

Free Bulletin W-17, "Welding with Ampco Bronze Electrodes." Bulletin No. RW-1—"Resistance Welding Electrodes and Alloys." "Ampco Alloys for the Process Industries" (CEC reprint)

AMPCO **Ampco Metal, Inc.**
Milwaukee 46, Wisconsin
West Coast Plant • *Burbank, California*

Tear out this coupon and mail today!

Ampco Metal, Inc., Dept. WE-11, Milwaukee 46, Wis.

I want the money-saving facts about Ampco Bronze electrodes. Send me, without obligation:

Check: ☐ Arc-welding Bulletin W-17 ☐ Resistance Welding Bulletin RW-1
☐ Ampco Alloys for the Process Industries (CEC reprint)

Name _____ *Title* _____

Company _____

Company Address _____

City _____ ( ) State _____

Now—YOUR WELDER CAN DO INERT GAS SHIELDED WELDING

WITH THE

Mid-States MISSING LINK

HIGH FREQUENCY ARC STABILIZER

MODEL 13 "MISSING LINK" ARC STABILIZER

- Finger Tip Remote Control at Torch
- Starts Arc Without Contact
- Constant Arc Stabilization
- No Idling Between Welds
- Automatic Gas and Water Control Valves
- Automatic Timed Gas Afterflow
- No Costly Gas Waste
- For AC or DC Welders

Yes, your present welder, AC or DC, can be equipped with the Mid-States "MISSING LINK" Arc Stabilizer for inert gas shielded welding. A compact unit with high frequency generating circuit, gas and water control valves, remote control relay and gas afterflow device—all built into one case. It is equipped with standard gas and water hose fittings, ready for inert gas shielded welding attachments.

The exclusive gas reservoir feature automatically gives selected time afterflow to protect the tungsten electrode after welding arc is broken . . . No electric timer needed . . . no moving parts to adjust or wear out . . . foolproof . . . can also be used for metal arc welding of heavy or thin gauge metals.

There are "Missing Link" Models for 0-300 Amp and 0-600 Amp Welders.

FOR METAL ARC WELDING

"Missing Link" Model 10 is the ideal unit for metal arc welding . . . No pecking or scratching . . . starts arc automatically . . . permits welding of all metals with ease.

REMOTE CONTROL

Small switchette on welding torch is depressed to energize high frequency circuit, start flow of gas and water, and establish welding arc! All stop automatically when arc is broken! Timed gas afterflow, to protect tungsten electrode, is also automatic!

Some territories open for representatives and jobbers. Write today.

SEE YOUR JOBBER OR WRITE DIRECT FOR INFORMATION COVERING THE COMPLETE LINE OF MID-STATES AC ARC WELDERS AND ACCESSORIES

MID-STATES WELDER MFG. CO.
6025 SO. ASHLAND AVE., CHICAGO 36, ILLINOIS

British Yards Build All-Welded Liner, Trawler

Two newly completed vessels evidence the continuing swing towards all-welded construction in British shipyards. These are the liner *Oronsay*, for service to the Orient, and a drifter-trawler for the fishing industry.

The *Oronsay* was built by Vickers-Armstrong at Barrow. Much prefabrication was employed in the construction, units of up to 40 tons being made in the shops before being put in the hull. Her decks are all-welded as are the machinery decks and fastening plates.

Another feature in the *Oronsay* is the use of shaft brackets, stern frame and rudder brackets made from welded rolled steel plate. It was the first use of such construction with so large a shaft horsepower rating—42,500. These welded brackets weigh only 60% as much as cast steel counterparts in a sister ship previously launched, the *Orcades*. Welding is claimed to have saved 500 tons weight in the steel hull of the *Oronsay* over the previously built ship.

The drifter-trawler was built by Richard Dunston Ltd., for the St. Andrews Steam Fishing Co., Ltd. Overall length is 94 ft and width 21½ ft.

Design of the hull is the outcome of tests carried out at the ship division of the National Physical Laboratory to determine the most efficient ship form. Each vessel was prefabricated in seven parts, six hull and one casing section. These were made in upside-down position to facilitate welding and plating. On completion, the sections were turned over and lifted to the launching berth where they were closed up and welded together. When the trawler was launched the main and auxiliary machinery had been installed along with a good part of the piping.

* * *

Eutectic to Publish Defense Welding Series

THE first in a series of technical welding manuals to aid in defense production has been published by Eutectic Welding Alloys Corp., New York City. Title of the manual is "Welding Engineering and Design."

The series will be known as the Eutectic National Defense Service Series. Other manuals scheduled for appearance include: "Jig and Fixture Design," "Tool and Die Salvage," and "Machine Repair, Maintenance and Salvage." Copies of the first manual can be obtained by writing to Eutectic at 40 Worth St., New York City 13.

$125 and 7 weeks saved, thanks to NI-ROD repair of cast iron speed reducer

When a mishap all but destroyed a vital coil-vat speed reducer, maintenance men of the M & R Dietetic Laboratories were faced with a serious problem.

A new speed reducer cost 135 dollars and would take 8 weeks to be delivered. Repairing the unit would require only a week, but the damage was so extensive that success seemed doubtful. Yet, there was so much to be gained that they decided to take the gamble.

The shattered speed reducer was sent to M & R's welding shop, where . . . using Ni-Rod® electrodes . . . their welding technicians succeeded in assembling the broken pieces.

The cost of the repair, including labor, was only 10 dollars, and the time required was 1 week. *This represented a net saving of 125 dollars and 7 weeks down time. A highly profitable operation, indeed!*

Experiences such as this . . . of time and money saved in welding cast iron with Ni-Rod electrodes . . . are daily occurrences at thousands of welding shops throughout the nation. The reason for Ni-Rod's popularity with these experienced welders is *dependability*. With Ni-Rod electrodes you get quick, sound, machinable welds in all grades of cast iron . . . usually without preheating or postheating. Ni-Rod works well in all positions; can be used with either AC or DC current.

The best way to find out about Ni-Rod's many advantages is to try it. Order a package today and discover for yourself why *4 out of 5 shops* re-order Ni-Rod, once they have tried it.

Your nearest INCO distributor stocks Ni-Rod in 3/32", 1/8", 5/32", and 3/16" diameters.

Coil-vat speed reducer repaired with Ni-Rod at M & R Dietetic Laboratories, Columbus, Ohio.

For welds you've never been able to make before . . . in high-phosphorous irons; heavy sections—

NI-ROD "55"

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

SAVE TACKING TIME!
Quick-acting, positive Danly KWIK KLAMPS hold pieces firmly in place for welding . . . clamping pressures up to 750 pounds maintain precision alignment. A single motion of the lever handle clamps or releases the work, saving precious production hours.
Available in 26 sizes and a wide variety of designs, KWIK KLAMPS suit almost every application. Select the style and size for your use from the booklet illustrated below.
SEND FOR YOUR KWIK KLAMP BOOKLET TODAY!
DANLY
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois
PRECISION DIE SETS ... TOOL, DIE AND GAGE MAKERS' SUPPLIES

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal — giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding — constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features — are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

Write for the new C-F Positioner Catalog

CULLEN-FRIESTEDT CO.
1309 S. Kilbourn Avenue Chicago 23, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

Stoody Co. Announces Revised List of Distributors

AFTER several changes and additions to the distributor list of Stoody Co., Whittier, Calif., the following firms now have Stoody hard-facing products on hand:

California: Agricultural Supply Co., Escondido; Hust Bros., Inc., Marysville; Moore's Welding Supply Co., Sacramento; G. S. Parsons Co., San Diego; California Welding Supply Co., Stockton; Hickinbotham Bros., Ltd., Stockton.

Florida: General Auto Supply Co., Inc., Tampa.

Illinois: J. C. Menzies and Co., Chicago.

Louisiana: Welders Equipment Co., Lake Charles and Welders Supply Co., New Iberia.

Maine: J. J. Boulter & Sons, Bangor; Northeastern Supply Co., Caribou; Lewiston Welding Co., Lewiston; Portland Welding Supply, South Portland.

Nebraska: Harrington Welding Supply, Gering.

New Mexico: Bowen Welding Supply, Clovis.

Oregon: Eugene Welders Supply Co., Eugene and Industrial Air Products Co., Portland.

Pennsylvania: Welding Materials, Inc., Lemoyne.

Texas: Taylor-Simpkins, Inc., El Paso; Gulf Welding Supply Co., Harlingen and C. F. Myrow Supply Co., Houston.

Washington: Western Oxygen, Inc., Seattle.

* * *

Four National Distributors To Handle Nelson Studs

FOUR new distributors for Nelson stud-welded fasteners have been announced by Leonard C. Barr, general sales manager of the Nelson Stud Welding Division of Morton-Gregory Corp.

United States Steel Supply Company will distribute "Rivweld" studs directly to purchasers of corrugated steel and aluminum roofing and siding.

Southern States Iron Roofing Co., Savannah, Ga., will distribute the studs in 13 southern states.

Philip Carey Mfg. Co., Cincinnati, and Asbestone Corporation of New Orleans, will both handle the Nelson studs to aid installation of their corrugated and flat asbestos products.

The Armstrong Cork Co., Lancaster, Pa., will handle Nelson stud-welding insulation pins and speed clips for use with industrial insulating materials on boiler and power house equipment, duct work and building enclosures.

For the Production Engineer's Notebook—

Ideas for Welded Design

Product engineers, even the geniuses among them, find that the formula, "1% inspiration, 99% perspiration,"* pretty regularly applies.

Perspiration in design is brought about by the inevitable conflict between operating function—how well the part will do its job—and such other important factors as sales appeal, serviceability, and manufacturing methods.

What we are all striving for is to apply welding most economically. We in LINDE stand ready to help the product engineer in the applications of welding methods wherever we can. Sometimes economies in production come from a substitution of welding for more expensive methods, but often just a small change in design or practice reduces the cost of present welding operations.

Pointers on welded design leading to production economies.

Use the process that gives the greatest total economy.

Design for down-hand welding where possible. But locate welds so as to minimize handling.

Mechanize welding. Weld as many joints simultaneously as possible.

Make minimum dimension changes when making different sized models.

Reduce the number of parts. But sometimes it is better to increase the number of parts and cut rejects in intricate castings or formings by welding together simple forms.

Use standard shapes and easily formed sections.

Pointers on welding processes leading to production economies.

UNIONMELT welding: high speed process for deep-penetrated welds—minimum cleaning and finishing—no spatter, sparks, or smoke—usually mechanized—will make butt, tee, and lap fillets, plug, and molded welds. Used for most ferrous and many non-ferrous metals. Ask LINDE for booklet F-6077.

HELIARC welding: used for most metals, especially aluminum, magnesium, stainless steel, and copper alloys. Particularly useful for sheet steel. Manual or mechanized—high speed—greatest feature is minimized cleaning and finishing because of flux and spatter elimination. Ask for booklet F-6291.

Take advantage of other economies that are inherent in such oxy-acetylene processes as flame-cutting, welding, surfacing, hardening. For more information on any of these processes call or write to The Linde Air Products Company, offices in principal cities.

* "Genius is 1% inspiration and 99% perspiration," credited in GOLDEN BOOK, April, 1931, to a newspaper interview with Thomas A. Edison.

THE LINDE AIR PRODUCTS COMPANY

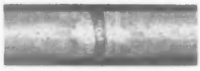
Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

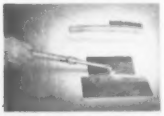
The terms "Heliarc" and "Unionmelt" are registered trade-marks.

Fully Re-Galvanizes Welds ....At Lower Cost



GALVALLOY

EASY TO APPLY!



Merely heat surface and

brush it on. Excellent, too, for filling blow holes and repairing corroded areas.

Bonds so strongly you can't burn it off. Galvalloy covers completely—without use of flux.

Saves you money—Galvalloy will not flow off as waste even when surface is heated cherry red. A little goes a long way.

High corrosion resistance—withstands a 30-day salt-spray test.

Galvalloy bonds perfectly to steel, cast iron, aluminum, magnesium and pot metal. No sand-blasting or cleaning needed. Used in repairs and fabricating. Write for literature and prices.

JOBBERS:
Better profits in Galvalloy.
Write for details.

METALLOY PRODUCTS COMPANY
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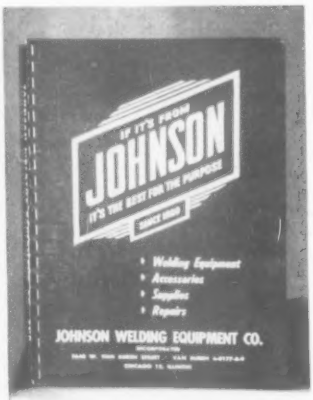

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WELDING EQUIPMENT
COMPANY
of Chicago, Illinois

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T. B. Jefferson to Speak At Detroit, Toledo AWS

GUEST speaker at the November 8 meeting of the Toledo section of the American Welding Society will be T. B. Jefferson, editor of THE WELDING ENGINEER. The Toledo meeting will be held at the Commodore Perry Hotel.

On November 10, Mr. Jefferson will speak before the Detroit section of the AWS in the auditorium of the Engineering Society of Detroit building. His subject for the Toledo and Detroit talks is "Welding and Its Role in the Future of America."

* * *

60,000 Studs Hold Aluminum, Glass for UN

AMONG unusual features of the nearly completed United Nations building in New York City are, in effect, two of the largest aluminum-framed windows in the world. From east and west elevations the building is almost transparent. Each wall is 500 ft high and 287 ft wide and contains 2,700 green tinted windows laced with thousands of pounds of aluminum extrusions.

The windows are secured by more than 60,000 studs installed by stud welding. The aluminum was supplied by Aluminum Company of America through its Cressona, Pa., extrusion works. Fabrication of the aluminum network members that strengthen the building's glass walls was by General Bronze Corp., Garden City, N. Y. General Bronze and Alcoa designed and produced a total of 39 different aluminum sections, made the necessary drawings, produced extrusion dies and extruded 500,000 lb of the light metal.

* * *

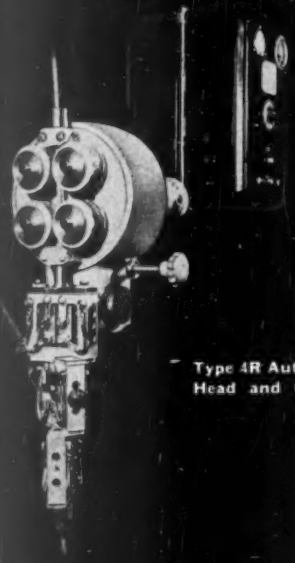
Hobart Publishes 40 Arc-Welding Lessons

THE complete series of 40 arc-welding lessons given at the Hobart Trade School, Troy, O., are now available in book form. The book, published by Hobart, bears the title *Modern Arc Welding Lessons, A-C and D-C*. It has a flexible blue fabricoid cover and costs $1.

The welding exercises are arranged in order of gradually increasing difficulty. The text is supplemented by many descriptive pictures, charts and diagrams. The book covers such subjects as welding common joints with bare electrodes, welding light gage sheets with coated electrodes, pipe welding, welding cast iron, etc.

Information on special prices for trade schools may be obtained from R. G. Swisher, Hobart Trade Schools, Inc., Troy, O.

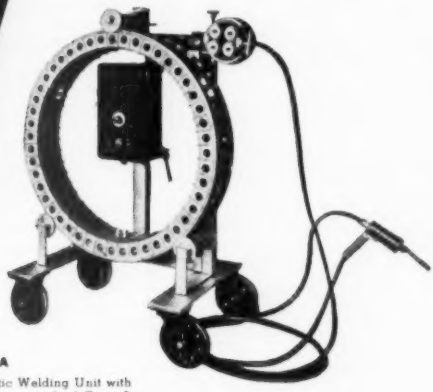
TWO NEW AUTOMATIC ARC WELDING HEADS



Type 4R Automatic Head and Control

THE REID-AVERY AUTOMATIC WELDING HEAD

THE REID-AVERY SEMI AUTOMATIC WELDING UNIT



Raco Type SA

Semi Automatic Welding Unit with reel and carriage to feed Type A heavily coated shielded arc wire. Capacity up to 3/16" wire.

TYPE 4R AUTOMATIC HEAD

The most universal welding head on the market today. Can be used with all types of automatic electrodes:—heavily coated shielded arc, lightly coated open arc. Also adaptable for submerged melt welding.

Can be used with any welding machine AC or DC.

The control is a self-contained unit with its own arc contactor for simplified wiring; just connect the welding machine cable to the arc contactor and plug in the control to the lighting circuit.

The head weighs only 38 pounds, has four driven rolls for positive feed without excessive wear or damage to wire coatings and 360° rotation with guide wheel—six mounting positions.

EXTREMELY SIMPLE CONTROL CIRCUIT
NO EXPENSIVE ELECTRON TUBES
NO EXTERNAL EXCITERS

TYPE S.A. SEMI AUTOMATIC WELDING UNIT

For those numerous jobs that do not warrant a full automatic welding fixture the REID-AVERY Type S.A. semi-automatic welding unit is ideal.

Designed to use the same electrodes as the full automatic head. The electrode is fed from the reel through a flexible tube to the welding gun at a rate proportional to the pre-set arc voltage. The operator merely guides the arc along the seam.

Note these advantages:—VISUAL ARC. Higher currents and speeds than are possible with manual electrodes—no craters in long seams—no stub end losses—simplified wiring, just connect the welding cables and plug into the lighting circuit—large rubber tired casters on carriage for portable operation.

Write For Descriptive Bulletin

The REID-AVERY COMPANY
INCORPORATED
DUNDALK • BALTIMORE 22 • MARYLAND

It is the sales policy of The Reid-Avery Company, Inc., to market our products exclusively through distributors and agents.

Members of THE AMERICAN WELDING SOCIETY *and* THE NATIONAL WELDING SUPPLY ASSOCIATION

JACKSON GOGGLES

- **FOR WELDING**
- **FOR CHIPPING AND GRINDING**

Jackson Goggles give adequate protection against the hazards of the jobs for which they are recommended. But to be effective they must also be worn. So we made them attractive in appearance, light and easy to wear. They are easy to adjust to any head size, and eye cups are easily fitted against the wearer's face.

The headrest type goggles, shown above, have concealed springs to hold the goggles gently against the face, and may be moved up and down with one hand.

Made in four types as shown below, the welding goggles have 50 mm. lenses in shades from 3 through 6, with cover glasses for protection. The grinding goggles have clear hardened lenses only.

JACKSON
PRODUCTS
WARREN · MICHIGAN

W•50 WR•50

FOR GAS WELDING

G•50 GR•50

FOR CHIPPING AND GRINDING

SOLD EVERYWHERE BY SAFETY SUPPLY DEALERS AND WELDING SUPPLY HOUSES

Show Welding Equipment at Plant Maintenance Show

WELDING and cutting will be prominent among displays at the Plant Maintenance Show, to be held Jan. 15-18 at the Public Auditorium in Cleveland. In addition to the many exhibits, there will be three days of conferences on maintenance problems.

General conferences start with a discussion of preventive maintenance. The various speakers will discuss inspection procedures, records and reports, and training men for maintenance. On the first day, there will also be sectional meetings on the maintenance of electrical equipment, maintenance of power plant and heating equipment, maintenance problems of small plants and the selection and maintenance of lighting equipment.

The second day's general session will cover organization and management for maintenance. This will include maintenance costs and their control and budgeting, incentive payment of maintenance workers, etc. Four sectional conferences will consider specialized maintenance in metal working plants, chemical plants, paper plants and food processing plants.

On the third day, the American Society of Lubrication Engineers will conduct a panel on lubrication.

L. C. Morrow, consulting editor of *Factory Management and Maintenance*, a McGraw-Hill publication, is general chairman of the conference.

* * *

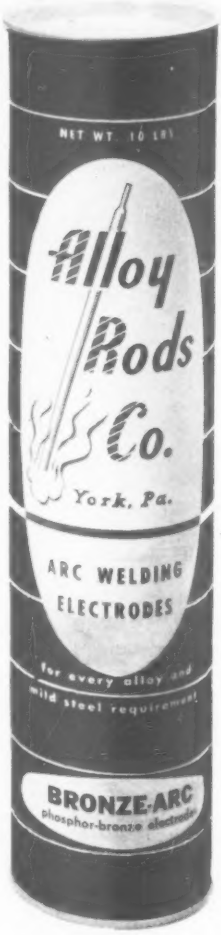
Install Automatic Welding

F. E. MYERS & Brothers, Co., Ashland, O., has announced plans to install automatic welding equipment. The company will also enlarge its machine shops, brass foundry and iron foundry.

"Know anything about railroad welding?"

The Quality Line
in the
STEEL CONTAINER

Moisture, dirt and grease proof . . . Easy to stock convenient 10 lb. size.



BRONZE-ARC
ARC WELDING ELECTRODES

BRONZE-ARC for ductile, high tensile welds on bronze, brass, copper, cast and malleable iron and steel. Smooth, quiet easy-flowing arc in all positions. Deposits are free from porosity and surface pitting. Low spatter. Alloy Rods Company, York, Pa.

*Cross section illustrating the exclusive Mallory Fluted water hole.**

Mallory Fluted and Bent Offset Tips for Resistance Welding

Set New Standards for High Production and Low Cost

Making news in the welding field is an old story at Mallory . . . where new and practical ideas are the result of extensive research in resistance welding alloys, tips, holders and dies.

Mallory cold bent offset tips with the cooling tube bent in place bring the cooling water directly to the welding area. This exclusive Mallory feature has established new records in offset tip life.

Mallory fluted tips give 70% more cooling area. These cooler-operating Mallory fluted tips are establishing new low cost-per-weld records in every application.

Now you can have the ultimate in your welders . . . a combination of fluted water holes in bent offset tips . . . and you can have them through Mallory and Mallory alone. They bring you startling new production records at no increase in cost.

That's value beyond expectation!

Mallory's resistance welding know-how is at your disposal. What Mallory has done for others can be done for you!

REASONS WHY MALLORY FLUTED TIPS ARE SETTING WELDING RECORDS

- 70% increase in cooling area.
- Faster heat dissipation.
- Reduced mushrooming.
- Less frequent dressing.
- More rigidity.

Available in all types of tips with #1, #2, and #3 Morse tapers.

West Coast Office and Warehouse: 1338 So. Lorena St., Los Angeles 23, California

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Resistance Welding Tips, Holders, Dies, Rod and Bars, Castings, Forgings

SERVING INDUSTRY WITH

Capacitors	Contacts
Controls	Resistors
Rectifiers	Vibrators
Special Switches	Power Supplies

Resistance Welding Materials

*Patent Pending

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MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

INCREASE PRODUCTION WITH
COST-SAVING, HEAVY DUTY
GASTON GRINDERS!

High speed, perfectly balanced Gaston portable grinders step up production—return their original investment in a few short months through savings in maintenance, power costs and labor. No gears, commutators or brushes are used in Gaston grinders. Write today for free bulletin.

RIGHT: HEAVY DUTY DISC GRINDER
with patented dust-free 3-phase motor. From ⅛ to 2 hp ratings, 230 volt, 60 cycle, 3400 rpm.

LEFT: EDGE GRINDER
—3400 rpm, 3-phase, 60 cycle, 230 volt edge grinders in ratings from ⅛ to 2 hp.

RIGHT: STAINLESS STEEL POLISHER
—750 rpm, 3-phase, 60 cycle, 230 volt polisher with special arbor for buffs.

There are still a few good territories open for manufacturers' representatives and jobbers.

GASTON POWER TOOLS, INC.
14829 LOOMIS STREET, HARVEY, ILLINOIS

National
Carbide

EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM
Write us for information as to nearest available stock.

NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

Nelson Stud Welding Holds Press Conference

NELSON Stud Welding Division of Morton-Gregory Corp. staged an informal press conference on Sept. 19 at its Lorain, O., plant in order to officially introduce two new power units built specially for stud welding (see THE WELDING ENGINEER, page 61, Oct., 1950).

Eleven representatives of publications, eight representatives of national distributors and two building contractors heard top Nelson executives discuss their company's past history, present accomplishments and future plans. Among those who spoke were: George E. Gregory, president; Leonard C. Barr, vice-president and general sales manager; W. J. Kane, vice-president and construction manager, and R. C. Singleton, manager of equipment and industrial sales.

The program also included a plant tour, followed by dinner at the Elyria Country Club.

Visitors left with the distinct impression that many new products of all types will be designed around that versatile new tool, the stud-welding gun. Most outstanding job of the year (as cited by Bob Singleton) was the development of stud-welded doors for open-hearth furnaces (see page 54).

* * *

C. E. Wilson Receives 1950 ASM Research Medal

CHARLES E. WILSON, president, General Motors Corporation, received the American Society for Metal's 1950 Medal for the Advancement of Research during the 32nd Metal Show in Chicago, Oct. 23-27. The award was established in 1943 to recognize the industrial executive who, over a period of years, has consistently sponsored metallurgical research or development and, by his foresight and his influence in making available financial support, has helped substantially to advance the arts and sciences related to metals.

Winner of last year's medal was Fred H. Haggerson, president, Union Carbide and Carbon Corp.

* * *

Correction

ON page 86 of the October issue, THE WELDING ENGINEER stated that a certificate of appreciation for work against accidents resulting in blindness had been accepted for The Linde Air Products Company by H. F. Reinhard. Mr. Reinhard accepted this certificate for the Electro Metallurgical Division of Union Carbide and Carbon Corp., of which he is manager of the safety codes division.

MUREX

HELPS PFAUDLER MAINTAIN High Welding Standards

MUREX
ELECTRODES

METAL & THERMIT CORPORATION
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Philadelphia
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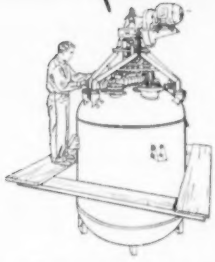

Murex Type FHP Electrodes play an important role in maintaining the high standards of welding set by The Pfaudler Co., manufacturers of glass lined and alloy processing equipment. This outstanding downhand electrode deposits weld metal of superior quality, and, at the same time is fast and easy to use.

Leading fabricators in many industries standardize on Murex — either to obtain better welding, or to achieve more economical production. Investigate Murex performance. Write for descriptive literature.

INDEPENDENT Acetylene Cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Storage cylinders available in 12' and 20' lengths, of 850 and 1,500 cu. ft. capacities.

INDEPENDENT ENGINEERING COMPANY, Inc.

CONSULTING · RESEARCH · DESIGNING

Manufacturers of

CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

We Invite Your Inquiries

THERE'S **SAFETY** IN THESE NUMBERS

No. 31 Grinders and Chippers Goggles

No. 335 Welders Coverspec Goggles

"CHAMPION"

EYEGARDS

with 10 way ventilation

"NEXT BEST THING TO YOUR EYES"

Compare Eye-Gards with higher priced goggles and you will find they give you the same in eye protection at far less cost. They're the goggles that provide greater comfort because the lightweight plastic frame is molded to form-fit the face . . . greater protection because the goggles are impact-resisting . . . greater ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool and fog-free. With all their exclusive features, they cost no more than ordinary goggles. Get Eyegard "Champions" on your next order.

Write for free catalog of Eyegard Equipment . . . it will save you money!

AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY

3503 Lakeside Avenue — Cleveland 14, Ohio

DIVISION OF THE SURDETT OXYGEN COMPANY • CLEVELAND, OHIO

Gulf Welding Opens New Louisiana Store

GULF Welding Equipment Co., New Orleans, La., has recently opened a new store in Morgan City, La. The new location is in the central part of southern Louisiana on the Atahafalaya River. This country is the base from which oil operators and producers are working on the continental shelf off the Louisiana coast.

The store is managed by Thomas D. Patterson, formerly of New Orleans. It is the newest addition to Gulf, which has been in existence since 1901. It was known as the Wm. D. Seymour Co. until 1944 when its name was changed to that it carries now.

* * *

Cummins Portable Tools Buys Wappat Tool Line

CUMMINS Portable Tools Division, Cummins Business Machine Corp., Chicago, has purchased the assets of Fred W. Wappat, Inc., Mayville, N.Y. Wappat has produced portable electric hand saws for 25 years. The new property will be operated by Cummins as the Fred W. Wappat division. Personnel and identity of the Wappat line will be retained.

* * *

R. I. Mendels to Sell New Contact Electrodes

THE FIRM of R. I. Mendels, Inc., 41 East 42nd St., New York City 17, will handle American distribution of the new "Norelco" contact welding electrodes made by North American Phillips Co.

Acceptance of the Norelco Contact 18 (E-6012) and Norelco Contact 20 (E-6020) on its approved list of electrodes was announced recently by the American Bureau of Shipping.

* * *

New M & T Distributors . . .

METAL & Thermit Corp. has added three new distributors for its line of welding equipment. They are: Beaver Welding Supply Co., 351 Jefferson Ave., Memphis 3, Tenn.; Hampden Oxygen & Acetylene Supply, Holyoke, Mass., and George M. Glover & Co., 1051 Waimann St., Honolulu 14, Hawaii.

* * *

Hammett Electric Moves

HAMMETT Electric Mfg. Co., makers of Hammett a-c welders have moved to a new address, 209 West 19th Terrace, Kansas City 4, Mo.

ADVERTISEMENT

Vulcan Copper & Supply Finds FOSTER Remote Control Improves Quality

Cincinnati manufacturer with fifty-year record of pioneering in the engineering of process plants and equipment reduces costs and betters results in year's operation.

BY CLAYTON B. HERRICK

VULCAN Copper & Supply Company is a fifty year old Cincinnati organization which has pioneered in the engineering and manufacturing of process plants and equipment. Their facilities are among the most modern available for the fabrication and welding of process equipment units.

In addition to copper and copper alloys, Vulcan has earned an outstanding reputation in the working and welding of stainless steel, nickel, Monel, aluminum, Hasteloy and other metals.

Vulcan has always been alert to any new welding developments. They employ arc, inert arc, acetylene, silver-brazing and resistance welding and a considerable amount is code work checked by X-ray testing machines. *No compromise is made with quality.*

This operator has been using FOSTER Remote Control for more than a year on alloy jobs of all types. With such complete control he saves the time and energy commonly used between machine and work.

Charlie Carter (right) is showing the special flexible cable to John Kelley, Welding Superintendent. With three control wires rope spiralled in the cable, there is no premium on size, weight, price or durability.

This company was quick to realize the many advantages of using FOSTER Remote Control. On products like heat exchangers, columns, extractors and evaporators, with material ranging from 16 gauge to two inches in thickness, a variety of rod sizes is used. For the highest quality welding Vulcan believes that the exactly correct current must be employed. *With FOSTER Remote Control the current is controlled right at the electrode holder.* Furthermore the polarity may be changed and the welding machine can be turned off and on as required *without the operator moving from his position.*

For over a year Vulcan Copper & Supply Company has found that FOSTER Remote Control contributes greatly to lowered costs and higher quality welding. *There has been no "down time" because of the special holder and cable used.* Both are subjected to continuous rough usage but have been built to "take it" and provide complete satisfaction despite hard service.

On this tank fabricated of Grade A nickel, each and every weld is critical. The welder, high in the air and far from his machine, is changing from 5/32" to 3/16" electrode. He is resetting the welding current accordingly.

How FOSTER Remote Control Works

THE equipment consists of a holder, welding cable with three control wires spiralled under the rubber sheath and a control box mounted on the machine. The operator can start and stop the machine, change polarity and control heat over three rod sizes without returning to the machine.

The welder is completely controlled by two knobs mounted at the rear of the holder grip. The front knob adjusts the heat with smooth stepless control. The rear knob controls polarity and starts and stops the machine. The holder is a standard popular make and is replaceable.

The *Control Box* is made from stainless steel. Component parts, such as relays and transformers are built to give long trouble-free service. The *cable* is made by a well known cable manufacturer. There are three No. 20 rubber covered control wires rope spiralled with the main conductor cable. The overall sheath is standard heavy rubber construction. Prices are competitive with standard cable.

Companies interested in the many advantages offered by FOSTER Remote Control for DC Arc Welders may obtain additional information by writing for booklet offered by FOSTER TRANSFORMER COMPANY, 3820 Colerain Avenue, Cincinnati 23, Ohio.

Fuse-Well

PLAIN AND ALLOY CAST IRON
WELDING RODS

Square "Fuse-Well" No. 11
(Cast Iron Gas Welding Rod)
Square "Fuse-Well" No. 14
(Moly Hi-Strength Rod)
Square "Fuse-Well" No. 16
(Hard-Surfacing Rod)
Round "Fuse-Well" No. 19
(Hard-Surfacing Electrode)
Round "Fuse-Well" No. 22
(Machineable Coated Electrode)

Sold Thru Leading Distributors

ELECTRODES
•
ALUMINUM
WELDING RODS

"FLUX-WELL"
WELDING
FLUXES

THE CHICAGO HARDWARE FOUNDRY CO.
"Dependable Since 1897"
2011O Commonwealth Ave. NORTH CHICAGO, ILL.

An Unbeatable Combination!

SILVALOY SILVER BRAZING ALLOYS

The Silvaloy group consists of 7 popular silver brazing alloys high in tensile strength and producing strong, ductile joints on ferrous and non-ferrous metals.

	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 50	50%	1160 F	1175 F
SILVALOY 45	45%	1125 F	1145 F
SILVALOY 40	40%	1135 F	1205 F
SILVALOY 35	35%	1125 F	1295 F
SILVALOY 20	20%	1430 F	1500 F
SILVALOY 15	15%	1185 F	1280 F
SILVALOY 503	50%	1195 F	1270 F

1200 All-Purpose Flux—for use on all metals. No. 1200 Flux readily dissolves oxides during brazing operations and aids in the flowing of the alloy. Meets all government specifications.

1100 Low Temperature Flux—superior where exceptionally clean surfaces on copper or copper alloys are required at lower temperatures.

COMPLETE STOCKS

Oxy-acetelyne welding rods and flux for cast iron, steel, aluminum, brass, copper, bronze, nickel, monel and inconel.

STEEL SALES
CORPORATION

3348 SOUTH PULASKI ROAD • CHICAGO, ILLINOIS

BRANCH PLANTS: Detroit, St. Louis • BRANCH OFFICES: Milwaukee, Minneapolis, Grand Rapids, Indianapolis, Kansas City, Mo.

About People

EDWARD F. JOYCE has been appointed manager of the eastern division of the Thermacote Co. He will be in charge of sales and plant production for the east coast and also for the midwest. GEORGE BOLLINGER will be assistant to Mr. Joyce.

* * *

WILLIAM F. WILLIAMS has been appointed vice president, manganese sales, for Taylor Wharton Iron & Steel Co., High Bridge, N. J. H. E. CRAGIN, JR., has been named assistant vice-president of manganese sales. JOHN P. REYNOLDS has been named assistant sales manager.

* * *

MAURICE N. TRAINER, first vice-president of American Brake Shoe Co., was elected president of the company recently. WILLIAM B. GIVEN, JR., president for 21 years, was elected chairman of the board. FRED P. BIGGS has been appointed president of the Brake Shoe and Casting Division. STEPHEN S. CONWAY has been appointed vice-president in charge of sales of the Brake Shoe and Castings and Southern Wheel Division.

* * *

GERALD C. QUINN, editor since 1945 of the Allis-Chalmers Electrical Review, has been appointed supervisor of industrial press relations. He succeeds NORMAN H. JACOBSON who has joined the Atomic Energy Commission in the newly created position of technological information officer.

* * *

DR. JAMES L. LAWSON has been appointed manager of the newly formed Electron Physics Divisions of the General Electric Research Laboratory. The divisions include the Electron Tube Division, the X-Ray Division, the Nuclear Physics Division and Communications Research.

* * *

ROBERT L. COE, president of Chase Brass & Copper Co., Inc., was recently elected chairman of the board. RICHARD C. DIEHL, former general manager of the Steubenville, O., plants of Wheeling Steel Corp., was elected president.

* * *

WARREN H. FARR, vice-president in charge of manufacturing of The Budd Co., will resign effective Jan. 1. He is one of the production pioneers of the auto industry, starting with Buick in 1904.

ROBERT C. JUVINALL, former supervisor of the engineering staff of the Chrysler Corp. research design department, has been named associate professor of mechanical engineering at Illinois Institute of Technology, Chicago. DR. WILLIAM ROSTOKER, of Toronto, Canada, a lecturer at the University of Birmingham, England, has been appointed an assistant professor of metallurgical engineering at Illinois Institute of Technology.

* * *

GEORGE D. GROGAN and DONALD MACFARLAN, JR., have been appointed district sales managers in Chicago and Detroit, respectively, for the heavy chemicals department of the Pennsylvania Salt Mfg. Co., Philadelphia.

* * *

NELSON W. DEMPSEY, general superintendent of the American Steel and Wire Company's Waukegan, Ill., plant, has been named to a similar post at the Cuyahoga works in Cleveland. JAMES E. BROWN, formerly assistant general superintendent at Cuyahoga works, becomes general superintendent at Waukegan.

* * *

A. J. SMITH has resigned as president and director of Black, Sivalls & Bryson, Inc., Kansas City, Mo. KENNETH W. LINEBERRY, who has been serving as chief executive officer for the past few weeks, is the new president. Mr. Lineberry has resigned as a vice-president and director of F. S. Yantis & Co., Chicago, a firm with whom he had been associated for 17 years.

* * *

Died . . .

EARLE S. HENNINGSEN, retiring manager of engineering of General Electric's Large Motor and Generator Divisions at Schenectady, N. Y., died Sept. 23. He was 60. He developed a technique for silver soldering amortisseur windings for synchronous motors and along with other G-E engineers he was a pioneer in developing welded steel fabrication to large rotating apparatus.

* * *

W. B. HORTON, welding engineer for Lincoln Electric Company's Chicago territory died on Sept. 19 at the age of 53. He was a member of the American Welding Society.

* * *

CPL. FRANK V. LOCKEFER, JR., son of Frank V. Lockefer, Sr., president of Mid-States Welder Mfg. Co., Chicago, was killed in Korea on Sept. 16. He was 29 and a veteran of four years' service in the Merchant Marine during World War II and four years' regular army service since 1946.

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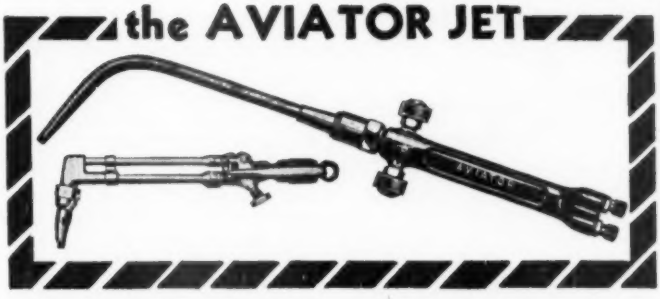

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Book Reviews

Arc Welding

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE. Published by Lincoln Electric Co., Cleveland, 1950. Simulated leather; 6 x 9 in.; 1,200 pages. Price $2.

This popular arc-welding handbook has been completely revised and reorganized. It now gives all the latest procedures for welding of metals and alloys by the manual, submerged-arc, semi-automatic submerged-arc and other processes.

A completely new chapter on weldability has been added. The information on structural design has been expanded and revised to tell more about rigid frame structures. Machine design data now includes more on tools made by welding.

The fundamentals of welded design for both machinery and structures are explained in another new chapter. Such subjects as stress allowables are discussed in regard to particular design problems. By referring to this chapter the average designer can find an answer to most of the problems that come up in connection with welding.

* * *

Metals

PROPERTIES OF METALLIC MATERIALS AT LOW TEMPERATURES. By P. Litherland Teed. Published by John Wiley and Sons, Inc., New York, 1950. Cloth; 5½ x 8½ in.; 222 pages. Price $7.

This book is one of a series of monographs on metallic materials published under the authority of the Royal Aeronautical Society of England. The subject is first outlined in relation to the fundamental physics involved, after which the specific information follows. The book is a critical survey of a large number of experiments rather than a dissertation on thermodynamical formulas.

The major mechanical properties at low temperatures are given in seven chapters for aluminum, iron, magnesium, copper, nickel, zinc, tin and lead. Ferritic and austenitic steels, because of their importance as engineering materials, have three chapters devoted to their characteristics. The behavior of welds is discussed under ferrous alloys. Welds are also included in the author's discussion of carbon steels.

Information is offered on the influence of low temperature upon the mechanical properties of metals and upon such factors as fatigue limit stresses, Young's modulus, shear modulus, bulk modulus, etc.

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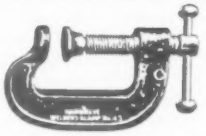

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30 YEARS AGO

(From THE WELDING ENGINEER of November, 1920)

USE of acetylene at 50 psi from a home-made acetylene generator is reported by a reader. He says he couldn't purchase a generator to operate at that pressure, which he considers necessary for certain jobs. (The editor hopes the reader sees some safety rules on acetylene before we have to send his WELDING ENGINEER to kingdom come.)

—30 YEARS AGO—

THE Dominion Oxygen Company Limited of Canada plans to build a chain of five oxygen plants in industrial centers in Canada. The first of these plants has been completed and is in operation at Toronto.

—30 YEARS AGO—

WELDED joints are used in the largest flying boat of its type in the world now being built by the International Aerial Navigation Co., St. Louis, Mo. Structural members are nickel-steel tubing and the fuselage is covered with sheet aluminum. The plane will have two Liberty 12 450 hp engines and is expected to carry 10 tons of cargo.

—30 YEARS AGO—

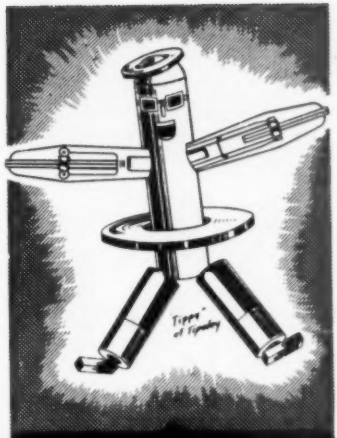
WELDED steel flag poles are a lot safer to climb, says a Chicago steeplejack. Wooden poles rot at the base and on top and soon becomes dangerous to paint or repair, he says. Iron poles with riveted joints are better than wood, but riveted seams soon rust out. The steeplejack recently painted a welded 105-ft pole for the Crane Co. that was six years old and in perfect condition.

—30 YEARS AGO—

THE oxyacetylene flame was used to separate two locomotives locked in a head-on collision recently. Both locomotives were ready for the junk-pile before the collision, which was staged for the benefit of visitors to the Minnesota State Fair at Minneapolis.

—30 YEARS AGO—

LICENSING of weldors is advocated by several letters to the editor this month. One comment from a railroad man reveals that the oldest man in the roundhouse usually gets to weld the most critical jobs whether he knows more about welding than the younger men or not. Professor A. S. Kinsey of Stevens Institute of Technology has also suggested the licensing of weldors.



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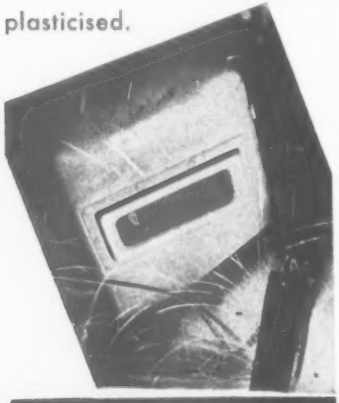

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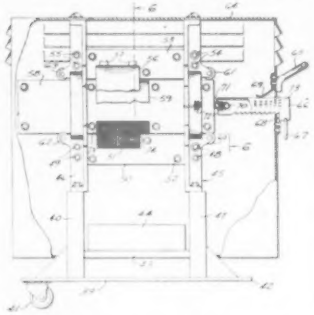
From the Patent Office

A-C Arc Welder

2,519,784. WILLIAM J. OESTERLEIN, Wauwatosa, Wis. Assigned to Harnischfeger Corp., Milwaukee. Filed Nov. 2, 1946. Granted Aug. 22, 1950.

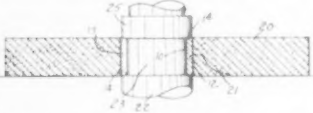


Patent covers a variable output a-c welder having two magnetic stationary field members. Each of the field members has on its inner face. A stationary winding with an open center is received with the notches. A movable magnetic core closely fits into the space between field members. The core has notches on it for taking a moving winding. The movable winding is made to pass through the open center of the stationary winding. Means are provided to move the movable winding from opposite the stationary winding to next to it.

* * *

Grinding Wheel Bushing

2,519,035. CHARLES C. ESTY, Framingham, Mass. Assigned to Norton Co., Worcester, Mass. Filed Feb. 15, 1950. Granted Aug. 15, 1950.



Patent covers a bushing for a grinding wheel. The bushing material is softer than 100 Brinell and has ridges around its circumference from end to end. There are grooves left between the ridges, however. The ridges have teeth interlocking with the grinding wheel in the central hole of the grinding wheel and chips of material from the bushing between the grooves and the grinding wheel.

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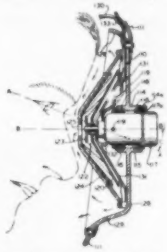
744 Broad St. Newark 2, N. J.

Arc Welding Mask

2,514,990. LEON DEWAN, New York City. Assigned one half to Percival W. Andrews, New York City. Filed Nov. 3, 1945. Granted July 11, 1950.

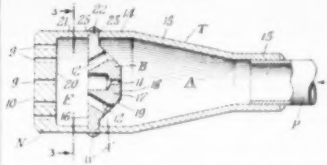


Patent refers to a mask for a welding job. It has an outer shield with a viewing hole and a rotary apertured shutter within the shield for transmitting a view through the hole. A blade attached to the shutter circulates air in the shield. A small motor in the mask drives the shutter.

* * *

Multi-Flame Heating Torch

2,518,543. FRANKLIN C. HASSE, Chicago. Assigned to The Linde Air Products Co., Filed Dec. 29, 1945. Granted Aug. 15, 1950.



Patent covers a multi-flame heating head that has two gas mixing chambers. A nozzle has gas discharge ports directly communicating with one of the chambers. A baffle between the chambers has gas ports extending through it. These gas ports are inclined toward each other and discharge converging gas streams into the chamber that is connected to the discharge ports.

* * *

Arc Welding Flux

2,509,654. EMMETT A. SMITH, East Cleveland, O. Assigned to The Lincoln Electric Co., Cleveland. Filed Aug. 14, 1947. Granted May 30, 1950.

Patent covers a flux for submerged-arc welding. The flux is a granular prefused material consisting essentially of a major part of a compound of silicon oxide and an oxide of a metal selected from the group of manganese, calcium, magnesium and aluminum, together with an oxide of a metal from the group consisting of lead, antimony and bismuth, in amount of a fraction of one per cent of such metal.

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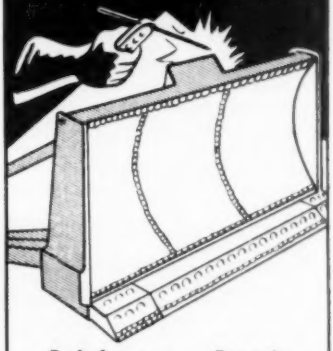

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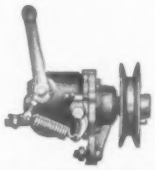

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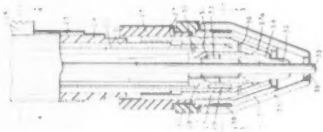
Inert Arc Torch

2,512,705. Nelson E. Anderson, Scotch Plains and George R. Turbett, East Orange, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed Oct. 25, 1947. Granted June 27, 1950.



Patent pertains to an electrode holder comprising an electrically conductive body portion, a collet supported thereby having an axial opening to receive an electrode. Resilient jaws hold the electrode in coaxial relation with the body. A collet sleeve has threaded connection with the body and surrounds the collet.

It also engages the collet jaws to press them against the electrode when the sleeve is screwed on the body. The lower part of the body has a collet receiving socket. The upper part of the collet has a socket engaging part with an outside diameter the same as the internal diameter of the socket. The collet is slidably and removably held in the socket.

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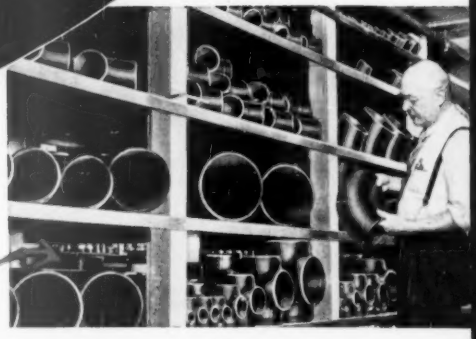

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